

## GENERAL DESCRIPTION

NOTE: For information pertaining to the Fleetwood Eldorado (693) frame, refer to the latter portion of this section.

A swept torque-box perimeter type frame, Fig. 2-1, is used on all 1969 model Cadillac automobiles, except the Fleetwood Eldorado. The frame is of fully boxed construction throughout its entire length. It encircles the passenger compartment with heavy side members, permitting a low floor with adequate seat height. This frame design also allows a small floor tunnel, and simplifies propeller shaft arrangement. Diagonal strut rod supports and two braced cross members support the front suspension and the engine front mounts. The frame has been extended in the front and two cross members added to provide a closer coupling

of the front bumper to the frame. Two supports and a cross member are provided for the engine rear mount.

A center bearing cross member is provided on the frames on Fleetwood Seventy-Fives and the Commercial Chassis to support the center bearing of the two-piece propeller shaft used on these models. This center bearing cross member is located between the number 3 and number 4 body mounting locations.

The perimeter type frame used on the 1969 Commercial Chassis is similar to the passenger car frame; however, it has heavier construction features and incorporates a lower rear kick-up to meet the requirements of the flat floors used on commercial vehicles.

## SERVICE INFORMATION

### 1. Body Mounts

Locations of the body mount holes of all 1969 model cars, except the 693, are shown in Fig. 2-2. Cross sectional views of the parts required for installation of body mounts, showing the order of assembly, appear in Fig. 2-3. The code letters in the frame diagram and their corresponding cross sections indicate the installation required at the body mount locations for each 1969 body style.

The actual number of shims used may vary with each installation, Fig. 2-3. Use the quantity necessary to fill the gap remaining between the body and frame after the recommended hardware is installed. The correct number of shims required at each mount location may be determined by attempting to rotate the pad between the body

and the frame. If the pad can be rotated with the fingers, add body shims until pad can no longer be rotated.

### 2. Checking Frame For Twist

1. Place car on section of level floor, and inflate tires to proper pressure.
2. Measure distance from top of extreme front end of left side rail to floor. Repeat measurement for right side rail.
3. If front ends of right and left side rails are not the same distance from floor, raise low side rail with a jack until distances are equal.
4. Measure distance from extreme rear end of top of left rear side rail to floor. Repeat for right side rail.

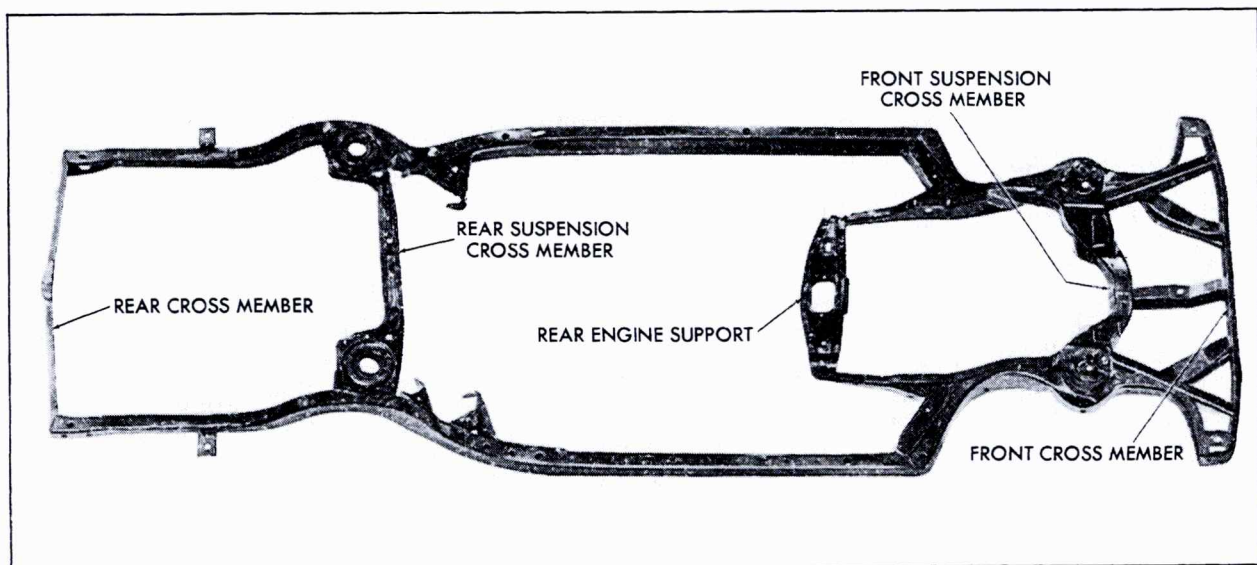
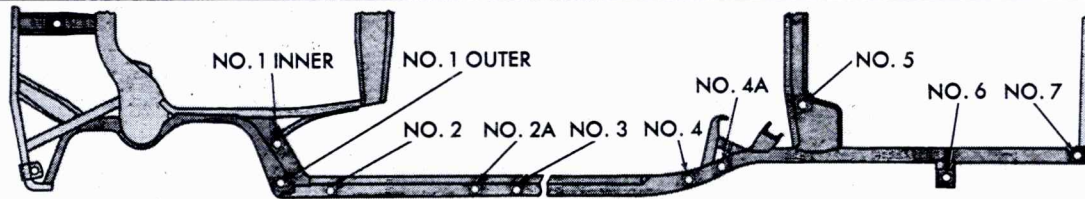


Fig. 2-1 Perimeter Frame (Except 693)



SERIES	NO. 1 INNER	NO. 1 OUTER	NO. 2	NO. 2A	NO. 3	NO. 4	NO. 4A	NO. 5	NO. 6	NO. 7
ALL MODELS EXCEPT THOSE SHOWN BELOW	G	E	—	—	*	—	F	C	B	A
CONVERTIBLE (68367)	M	M	—	D	—	—	F	C	B	A
FLEETWOOD SEVENTY-FIVE (69723-69733)	G	E	N	—	L	—	F	C	B	A

\* 680 AND 681 SERIES USE "P" BODY MOUNT

Fig. 2-2 Body Mount Location (Except 693)

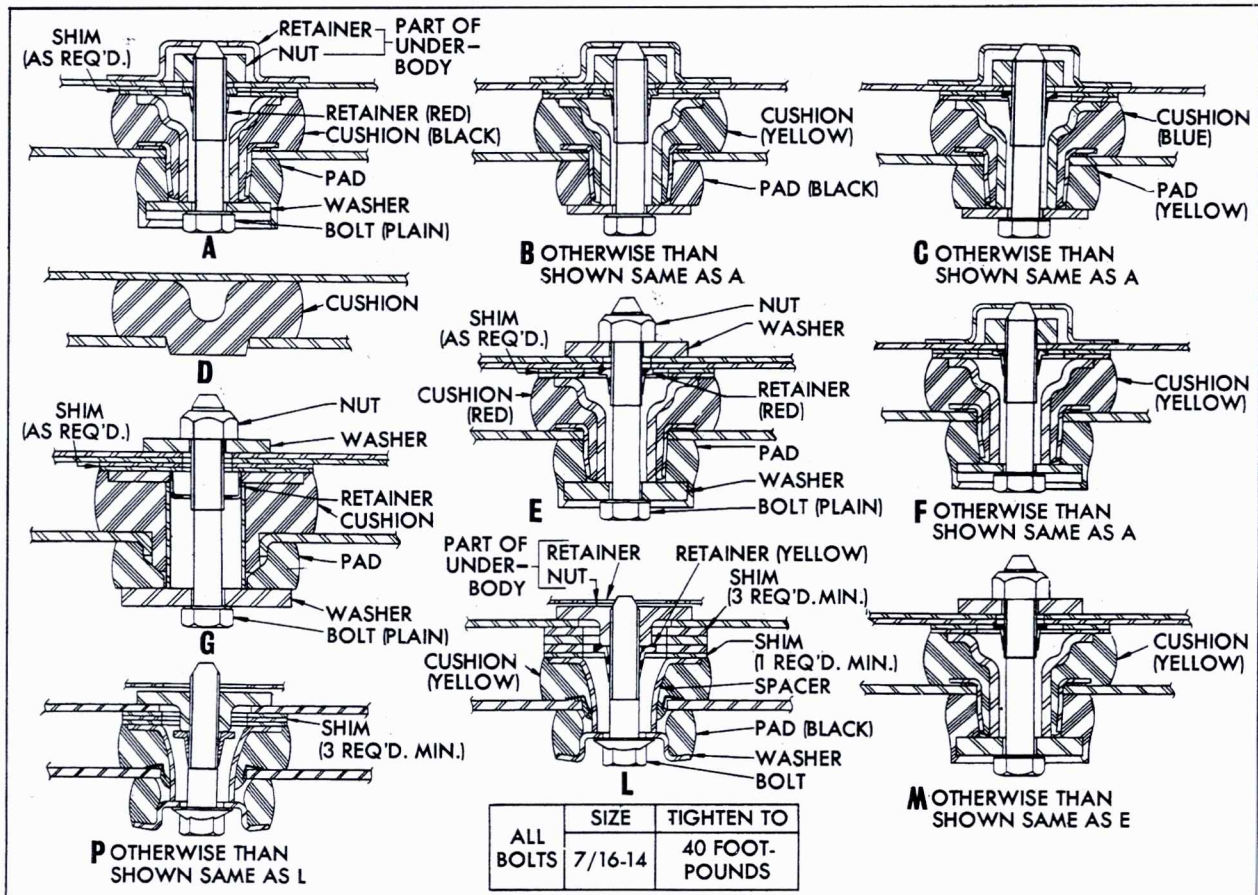


Fig. 2-3 Body Mounts (Except 693)



5. Any difference in these dimensions greater than one-half inch is an indication of a twisted frame.

6. If frame is found to be twisted after checking the overall dimensions, measure distances from similar points on each side rail to floor, starting from front of frame. The twist is between the first points where a difference is found and the last where the distances were equal.

### 3. Checking Frame Dimensions

Refer to frame checking locations, Fig. 2-4. The car should be on a flat, level floor to assure accurate measurements when either of the following methods are used.

The easiest and most accurate method of checking frame dimensions is by use of tram gages. When using tram gages, be sure to keep the gage cross bar level to insure accuracy in all measurements.

The "plumb bob" method may be used for measuring frame dimensions if tram gages are not available. Using this method, it is only necessary to have a piece of cord attached to an ordinary surveyor's plumb bob. When measuring the distance between two points, the free end of the cord should be placed at one of the points and a mark made on the floor exactly under the plumb bob. This operation should be repeated at the other point, and the distance between chalk marks on the floor may be easily measured.

NOTE: The following dimensions apply to all series except the 693 unless otherwise noted.

A - Width of front cross member: 62".

B - Maximum span of frame at front suspen-

sion cross member: 45-11/16".

C - Outer #1 left location to outer #1 right location: 58-5/8".

D - Width of rear cross member: 50-1/2", Commercial Chassis 54-1/2".

E - Front vertical surface of front cross member to centerline of front wheels: 26-5/8".

F - Centerline of front wheel to outer #1 location: 25-1/4".

G - Outer #1 location to #4 location: 73-21/32", Commercial Chassis 98-5/16", Fleetwood Sixty Special Sedan and Fleetwood Brougham 77-5/32", Fleetwood Seventy-Five 93-31/32".

H - Number 4 location to centerline of rear wheels: 30-5/8", Commercial Chassis 32-1/2".

I - Centerline of rear wheels to rear vertical surface of rear cross member: 48-3/4", Commercial Chassis 45-1/4".

J - Height of top surface of front cross member above normal top surface of side rail at #1 outer location: 6-1/2".

K - Height of top surface of side rail at front suspension cross member above normal top surface of side rail at #1 outer location: 6-3/4".

L - Height of top surface of rear suspension cross member at centerline of rear wheels above normal top surface of side rail at #1 outer location: 12-1/4", Commercial Chassis 6-1/2".

M - Height of top surface of rear cross member above normal top surface of side rail at #1 outer location: 2".

Dimensions for X, Y, and Z are not given, as they illustrate points for taking diagonal measurements for checking the squareness of the frame. Easily identifiable features of the frame are located at the approximate terminal points of the arrows and should be used in making these measurements.

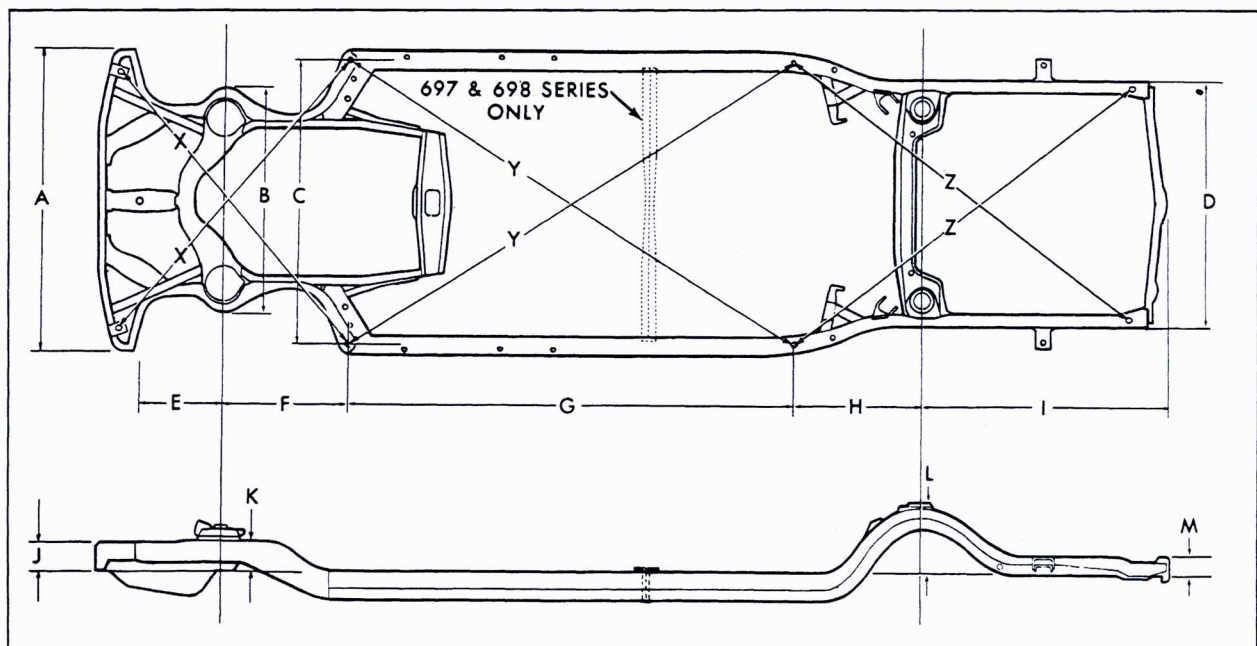


Fig. 2-4 Frame Checking Points (Except 693)

## FLEETWOOD ELDORADO FRAME

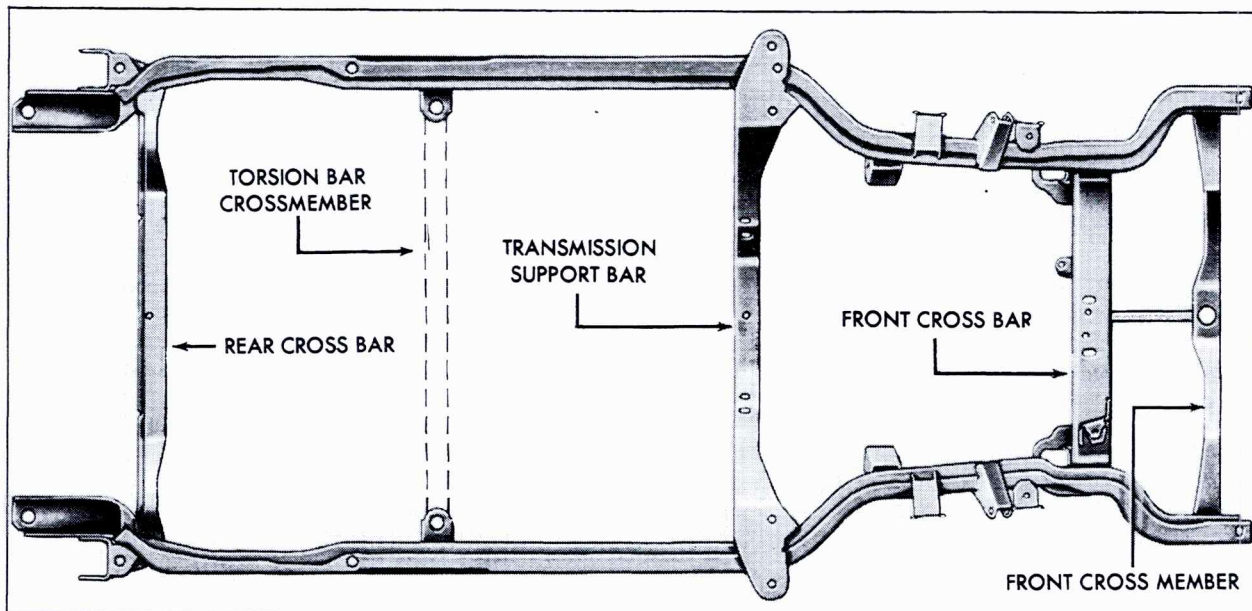


Fig. 2-5 Frame - 693

## GENERAL DESCRIPTION

The Fleetwood Eldorado frame is of a fully boxed construction. The frame encircles the passenger compartment ending at the rear seat location. This is done to provide maximum space utilization at the rear of the automobile. Rear structural requirements are met by a sub-frame that is part of the body assembly.

In addition to the cross members that are part of the frame assembly, Fig. 2-5, a torsion bar cross member is mounted on rubber and bolted to two brackets on the frame. This cross member anchors the ends of the front suspension torsion bars to the frame assembly.

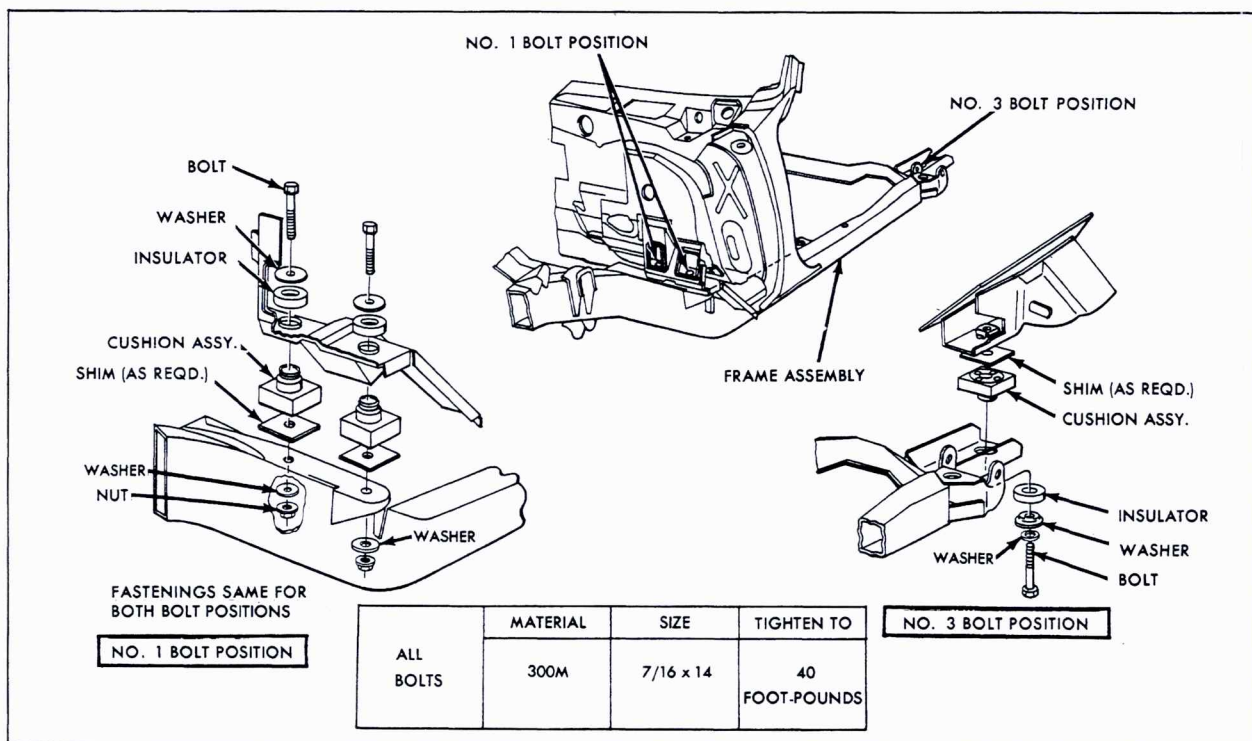


Fig. 2-6 Body Mounts - 693



## SERVICE INFORMATION

## 4. Body Mounts

Locations and exploded views of body mounts used on the 693 series are shown in Fig. 2-6.

The actual number of shims used may vary with each installation. Use the quantity necessary to fill the gap remaining between the body and frame after the mounting pads are installed. The correct number of shims required at each mount location may be determined by attempting to rotate the pad between the body and the frame. If the pad can be rotated with the fingers, add body shims until pad can no longer be rotated.

## 5. Checking Frame Dimensions

Refer to frame checking locations, Fig. 2-7. The car should be on a flat, level floor to assure accurate measurements when either of the following methods are used.

The easiest and most accurate method of checking frame dimensions is by use of tram gages. When using tram gages, be sure to keep the gage cross bar level to insure accuracy in all measurements.

The "plumb bob" method may be used for measuring frame dimensions if tram gages are

not available. Using this method, it is only necessary to have a piece of cord attached to a -ordinary surveyor's plumb bob. When measuring the distance between two points, the free end of the cord should be placed at one of the points and a mark made on the floor exactly under the plumb bob. This operation should be repeated at the other point, and the distance between chalk marks on the floor may be easily measured.

A - Width of front cross member: 46-27/32".

B - Outer #1 left body bolt to outer #1 right body bolt: 54-13/16".

C - Number 3 left body bolt to #3 right body bolt: 40-15/16".

D - Front vertical surface of front cross member to centerline of front wheels: 27-11/16".

E - Centerline of front wheel to outer #1 body bolts: 21-23/32".

F - Outer #1 body bolt to #3 body bolt: 77-25/64".

G - Height of top surface of front cross member at center of frame below normal top surface of side rail at front cross member: 5-15/16".

Dimensions for X and Y are not given, as they illustrate points for taking diagonal measurements for checking the squareness of the frame. Easily identifiable features of the frame are located at the approximate terminal points of the arrows and should be used in making these measurements.

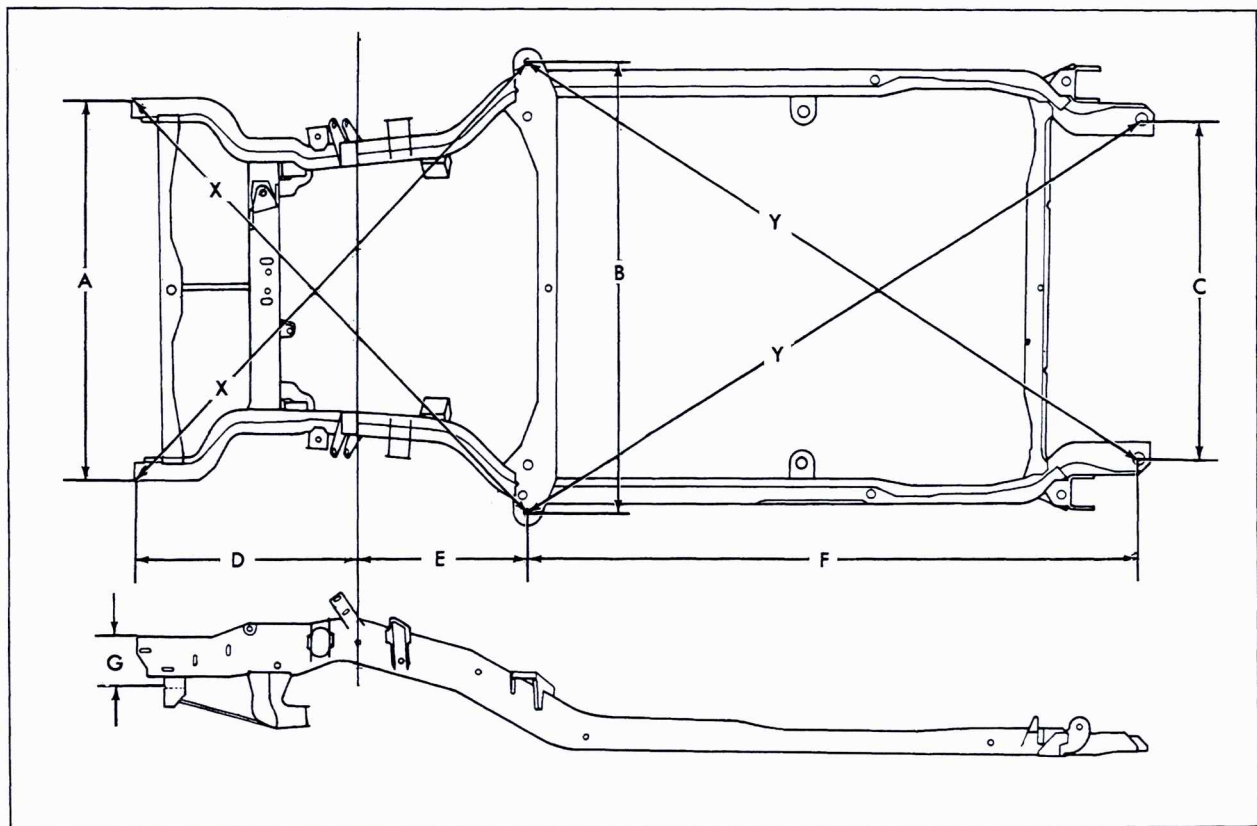


Fig. 2-7 Frame Checking Points - 693





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# FRONT SUSPENSION

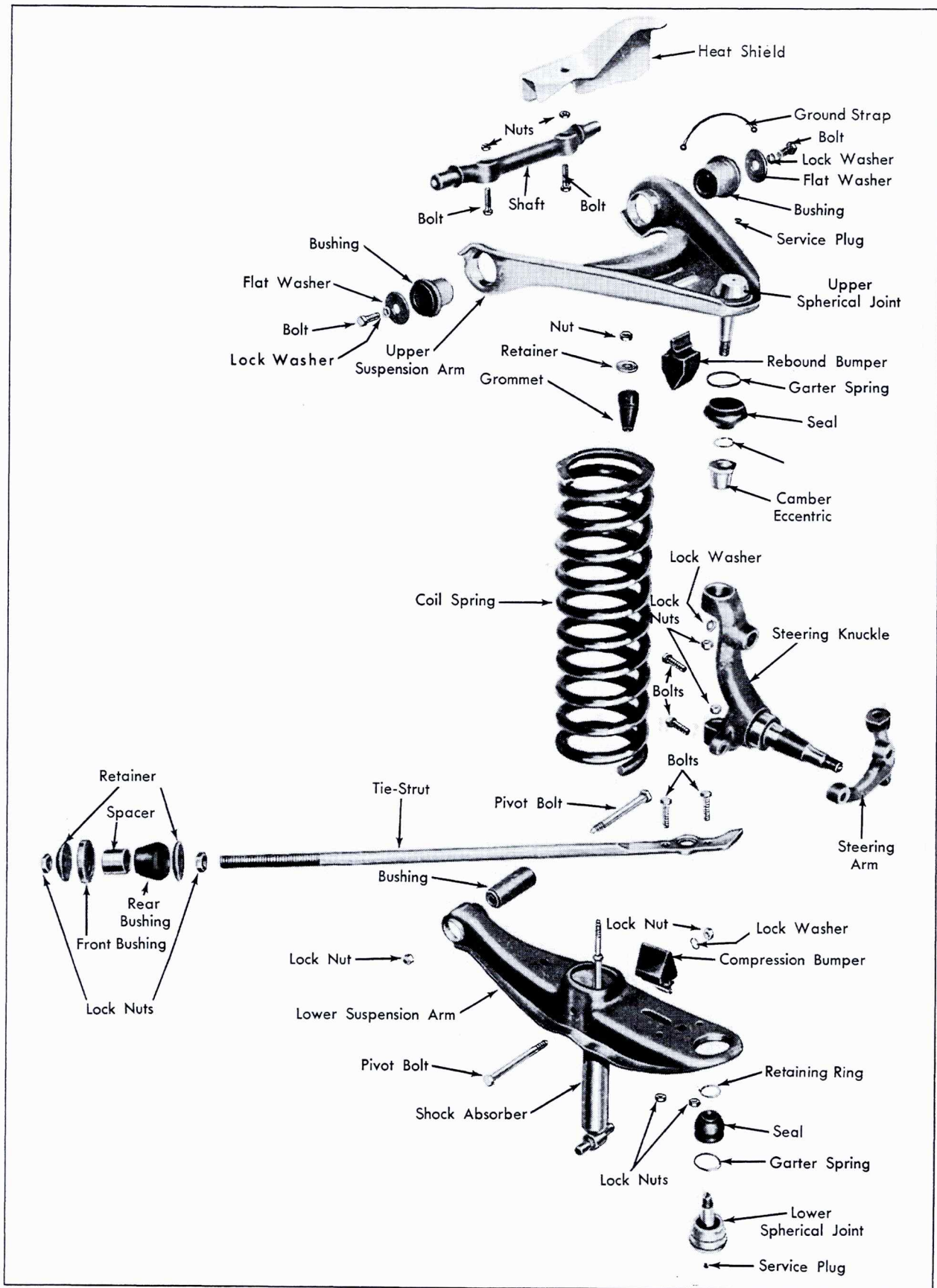


Fig. 3-1 Front Suspension Disassembled



## GENERAL DESCRIPTION

All 1969 Cadillac cars use an independent spring type front wheel suspension system. The front suspension system consists of two upper and lower control arm assemblies, steel coil springs, shock absorbers, front diagonal tie-struts, and a stabilizer bar, Fig. 3-1. Rubber bushings are used at all frame attaching points.

The front suspension system is designed so that the geometry of the upper and lower suspension arms produces an anti-dive reaction during braking.

The front suspension system used on the Fleetwood Eldorado is described on page 3-25.

### Front Suspension System

#### a. Spherical Joints

Spherical joints are used at the outer ends of the upper and lower control arms. These joints are packed with lubricant and sealed at assembly, and should not require further lubrication throughout their service life under normal driving conditions. The only maintenance they normally require is an inspection of the seals for physical damage each time the engine oil is changed.

Service plugs are provided in the spherical joint covers so that the joints may be packed in the event a seal should become damaged and require replacement. Both the seals and plugs are serviceable.

The upper spherical joint is pressed into the upper suspension arm and tack-welded to the arm at two points. It connects the upper suspension arm to the steering knuckle through a camber adjustment eccentric. Camber adjustment is made by turning this eccentric to move the steering knuckle in or out at the top. The lower spherical joint, a tension type joint, is pressed into the lower suspension arm. It connects the lower suspension arm to the steering knuckle.

The spherical joints are designed to allow both the up-and-down movement of the wheel due to road irregularities, and the pivoting movement that takes place as the wheels are turned while steering.

#### b. Compression and Rebound Bumpers

A rubber compression bumper on the lower suspension arm limits upward travel of the suspension system and a rubber rebound bumper on the upper suspension arm limits downward travel. Both bumpers are held in place by means of a pull-through tab.

#### c. Tie-Struts

Diagonal tie-struts are used on the front suspension system to control the fore and aft movement of the wheels. The struts are bolted to the outer ends of the lower suspension arms, just inboard of the spherical joints, and extend through

the frame front cross member. Rubber bushings and a steel spacer are used at the frame mount.

The forward ends of the struts are threaded and secured to the frame cross member by bushing retainers and locknuts. Caster adjustments are made by adjusting the locknuts on the threaded ends of the struts.

#### d. Suspension Arms

The upper suspension arms pivot at their inner ends on two flanged rubber bushings, one at each end of the one-piece suspension arm shaft, which is bolted to the top surface of the spring tower on the front suspension frame cross member. The lower suspension arms pivot on a single rubber bushing that is bolted to the front suspension frame cross member.

The upper suspension arms and spherical joints are interchangeable, left and right, previous to being welded into an assembly. The lower suspension arms are not interchangeable, but their spherical joints are interchangeable.

#### e. Steering Knuckle

The steering knuckle is mounted to the tapered spherical joint studs at the outer ends of the upper and lower suspension arms. The support plate and splash shield are bolted directly to the upper end of the steering knuckle. The steering arm, support plate and splash shield are fastened to the lower end of the steering knuckle by two bolts extending through the steering knuckle, steering arm, support plate and dust shield.

The tie-struts, steering knuckles, and upper suspension arm shafts are interchangeable right and left, but the steering arms are not.

#### f. Stabilizer Bar

A front end stabilizer bar is used to provide steering stability and to control body roll. The stabilizer bar is mounted on the frame front side rails forward of the suspension arms and is connected to the lower suspension arms by steel links that are cushioned at each end in rubber bushings. The stabilizer bar extends straight across the car between its frame mounts.

#### g. Springs and Standard Shock Absorbers

The front wheels are controlled in their up-and-down movement by steel coil springs and direct acting, permanently sealed shock absorbers.

The springs are mounted with the lower ends seated on the lower suspension arms and the upper ends seated in towers on the front suspension frame cross member.

The standard shock absorbers incorporate a nylon skirted piston that provides a long-life bearing surface and uniform control of oil bleed around the piston. These shock absorbers provide



efficient and constant damping control because oil is separated from air in the reservoir, which eliminates aeration of oil and prevents lag. Separation is accomplished by means of a pliacell envelope filled with an inert gas that takes the place of the air pocket.

## SERVICE INFORMATION

**CAUTION:** If any mispositioning, incorrect assembly, or failure of components in the area of the brake system pipes, hoses, or cylinders is observed, be sure to check for any brake damage that may have resulted from such a condition and correct as required. Components that could damage the brake system due to mispositioning, incorrect assembly or failure include the exhaust system, shock absorber, springs, suspension control arms, stabilizer bar, power steering pump hoses and transmission cooler pipes.

When performing front end alignment or other operations that require loosening the camber eccentric in the knuckle by striking the bottom of the stud, exercise caution to prevent the striking tool from slipping and hitting the brake hose.

Any damage to the brake hose could result in early failure.

When removing the camber eccentric or disconnecting the upper control arm ball stud, do not use the brake line to support or suspend the disc or caliper, as damage to the hose could result.

### 1. Front Wheel Alignment (Fig. 3-2)

#### a. Sequence of Operations

Front wheel alignment must be checked whenever the standing height is changed or after removal and installation of an upper control arm assembly, a lower control arm, tie-strut, or a steering knuckle.

Front wheel alignment must be performed in the exact sequence as described in this procedure. Wheel alignment equipment manufacturers provide detailed instructions for checking wheel alignment with their alignment equipment. These instructions should be carefully followed.

In addition to the manufacturer's instructions, be sure to observe the following recommendations:

**NOTE:** Car must be on a level surface, gas tank full or a compensating weight added, front seat all the way to the rear, and front and rear tires inflated to the proper pressures. Refer to Tire Pressure Chart, Fig. 10-9, Section 10. Both doors must be closed and no passengers or additional weight should be in car or trunk.

1. Check standing height and adjust, if necessary. Refer to Note 32.

The front shock absorbers are positioned in the center of the coil springs and are attached at the upper ends to the spring seat towers. The lower ends are attached to the lower suspension arms by pivot bolts that go through the arms and the lower shock mount sleeves.

2. Raise car and check lateral run-out of both tires. Make a mark on the tire where maximum run-out occurs.

3. Rotate wheel so that the maximum run-out points either to the front or to the rear of car. (This neutralizes the effect of run-out on caster or camber). Lower car and recheck for proper alignment on alignment equipment.

4. Bounce front of car up and down several times to normalize the front standing height.

5. Check straight ahead position of steering wheel. Adjust if necessary.

#### b. Caster

Caster is adjusted by turning the locknuts on the forward ends of the tie-struts at the frame front cross member, Fig. 3-3. Adjustment is made from under car.

Preferred caster range is  $-1/2^\circ$  to  $-1\ 1/2^\circ$ . Do not reset unless caster exceeds the preferred range by  $1/2^\circ$ , or side to side settings vary beyond  $1^\circ$ .

Proper caster adjustment is obtained by shortening or lengthening the tie-struts between lower suspension arms and frame front cross member to tilt vertical axis of wheel either "fore" or "aft".

Before adjusting caster, loosen tie-struts at lower suspension arms. This will allow tie-strut to center itself and prevent damage to bushings and premature wear at frame front cross member.

To provide more negative caster, lengthen tie-struts by loosening front locknuts and tightening rear locknuts. One turn of locknuts results in approximately  $1/2^\circ$  change in caster.

To provide more positive caster, shorten tie-struts by loosening rear locknuts and tightening front locknuts.

After proper caster adjustment has been made, tighten tie-strut mounting bolt nuts at lower arms to 55 foot-pounds, and front locknuts to 35 foot-pounds, Fig. 3-3. Recheck to make sure adjustment is correct after locknuts have been tightened.

#### c. Camber

Camber is adjusted at the camber eccentric located in steering knuckle upper support, Fig. 3-4. The upper spherical joint stud fits through the camber eccentric and the knuckle. Turning camber eccentric moves the steering knuckle in or out at the top.



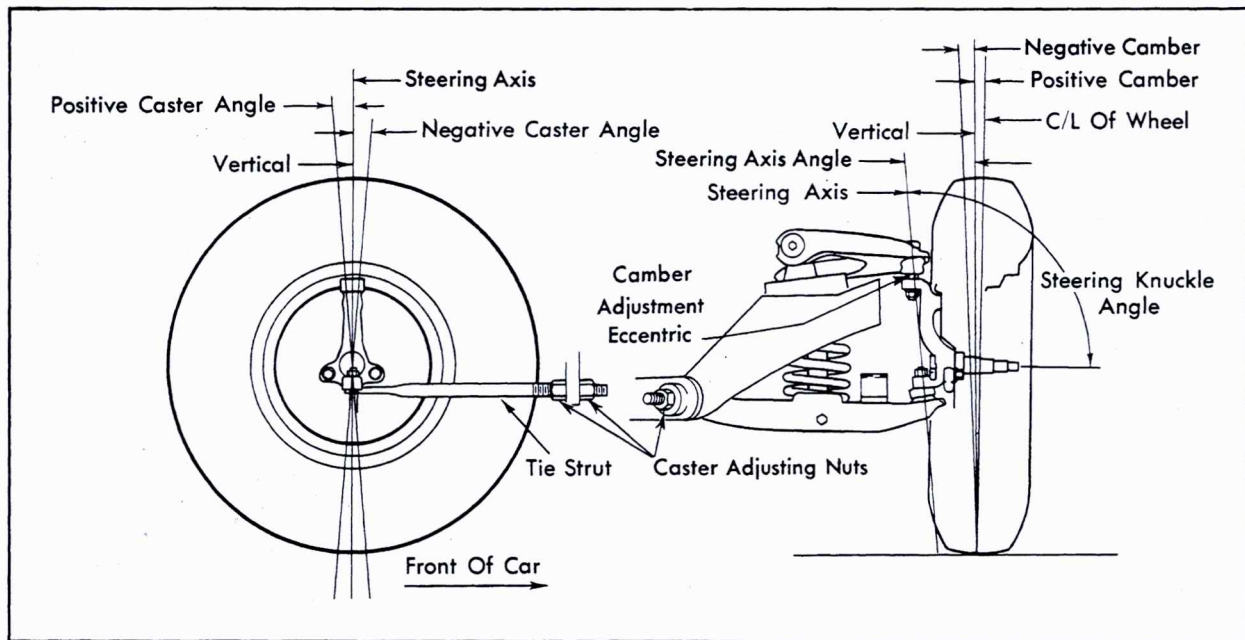


Fig. 3-2 Elements of Front Wheel Alignment

To adjust camber, loosen locknut on spherical joint stud one turn and tap bottom of stud with soft mallet to free camber eccentric in knuckle. If camber eccentric will not break loose, install a standard nut halfway on end of stud. Make certain that locknut is loose, then insert a 7/16 inch diameter steel rod, approximately 20 inches long, inside nut so that it rests against stud. Strike rod with heavy hammer, Fig. 3-5, to break camber eccentric loose.

**CAUTION:** Use extreme care to prevent the striking tool from slipping and hitting the brake line.

Using Crow Foot Adapter, J-5680-01, Fig. 3-6, turn camber eccentric until desired camber is obtained. Preferred camber range is  $\pm 3/8^\circ$  to

$-3/8^\circ$ . Do not reset unless camber exceeds the preferred range by  $3/8^\circ$ , or side to side settings vary beyond  $1^\circ$ .

Final position of joint stud should be in rear portion of camber eccentric in order to keep steering arm angle correct. Tighten locknut on spherical joint stud to 60 foot-pounds.

#### d. Toe-In

Before checking toe-in, make certain that the distance from the center of the outer tie rod pivot, to the center of the inner tie rod pivot measures the same for both tie rods and that drag link

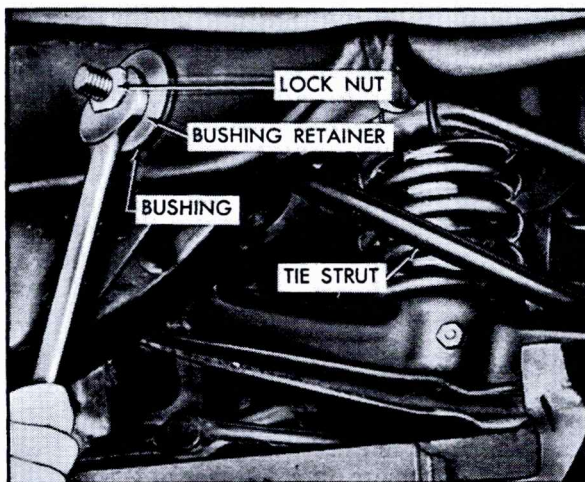


Fig. 3-3 Adjusting Caster

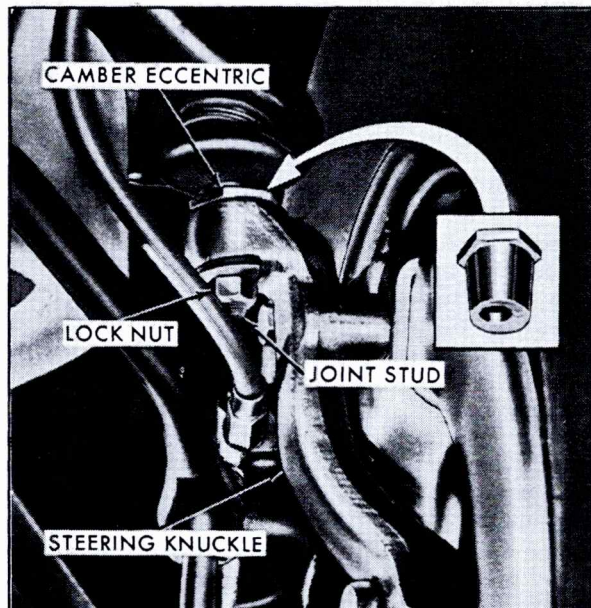


Fig. 3-4 Camber Adjusting Eccentric



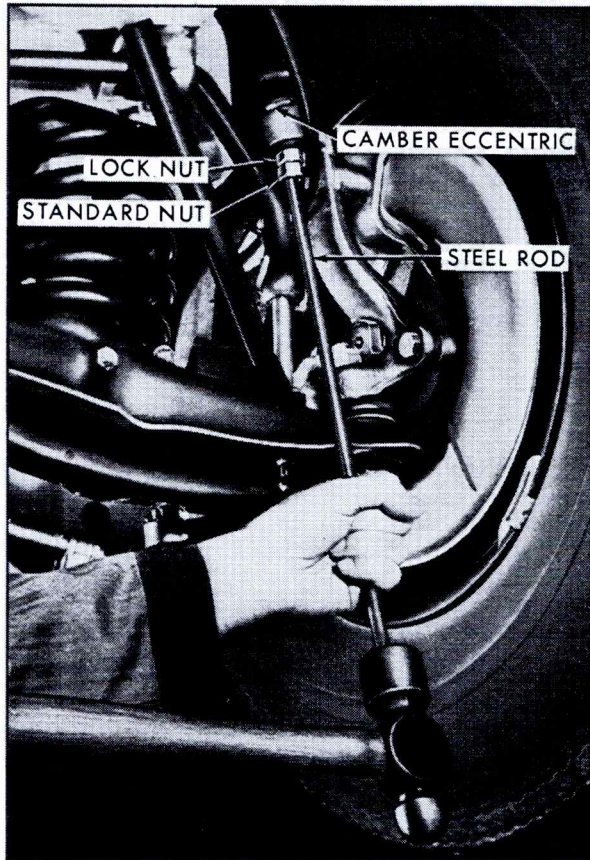


Fig. 3-5 Loosening Camber Eccentric

height is correct. See Section 9, Note 5, for drag link height. The readings should be taken only when the front wheels are in a straight ahead position and with steering gear on its high spot. Preferred toe-in range is 1/8 inch to 1/4 inch. Do not reset unless toe-in exceeds the preferred range by 1/8 inch.

Toe-in is adjusted by turning the tie rod adjuster tubes at outer ends of each tie rod after loosening clamp bolts.

**CAUTION:** Do not use a pipe wrench or heavy tool to free tie rod adjuster tubes if they are seized, rusted or corroded. If necessary, use penetrating oil or pry tie rod adjuster tubes open with a flat bladed tool. Replace tie rod, adjuster tubes, or tie rod outer pivots if damaged. The tie rod adjuster tubes should be lubricated with chassis lubricant if disassembled from tie rods for any reason. When turning adjuster tubes, be careful not to turn tie rod ends so that they bottom out, as seals could get pinched between stud and socket and become damaged. If this happens the entire pivot must be replaced.

Be sure to turn both adjuster tubes an equal amount when adjusting toe-in so that relation of steering gear high spot to straight ahead position of front wheels will not be changed.

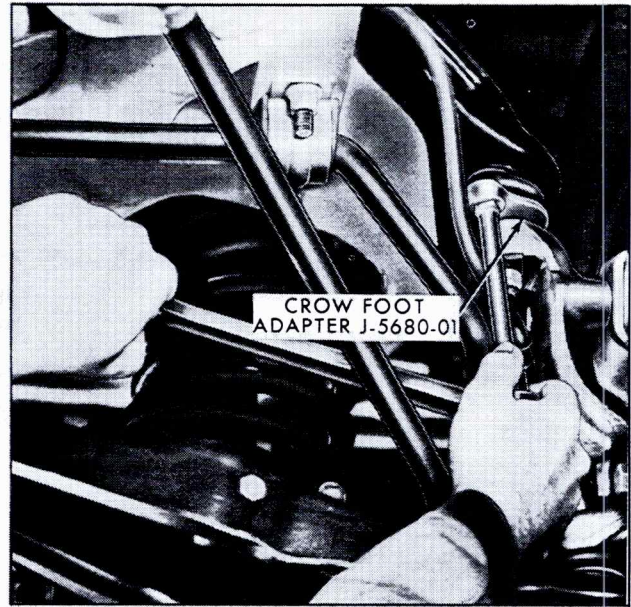


Fig. 3-6 Adjusting Camber

(Both left and right pivot ends have left hand threads.)

When adjustment has been completed, according to recommended specifications, tighten nuts on clamp bolts to 20 foot-pounds.

**NOTE:** Be sure that open sides of clamps are pointed downward within 45° of vertical to prevent possible interference with the frame on maximum compression. Both the tie rod ends and joint studs should be in a centralized position before tightening clamps. Check relationship between jaws of clamp and slot in adjuster tube. Do not allow corner of one to catch on a corner of the other, Fig. 3-7. Turn clamp until corners clear each other, but do not rotate it more than 45° from straight down.

Each tie rod should be checked after adjustment by grasping the center of the tie rod and moving it up and down. The movement should be equal in both directions; if not, it is an indication that the pivot studs are not properly positioned. If tie rods are not properly positioned, a binding condition may occur, resulting in poor return of wheels to straight ahead position. Also check steering linkage joints for looseness. Replace inner or outer tie rod pivot if loose.

Make certain that steering wheel is centered after toe-in adjustment has been made. If necessary, readjust toe-in to center steering wheel.

## 2. Checking Front Standing Height

Before checking standing (spring) height, make sure that trunk is empty except for spare tire and jack, and that there is a full tank of gasoline, as all specifications are based on this curb weight. Normalize position of springs by bouncing bumper



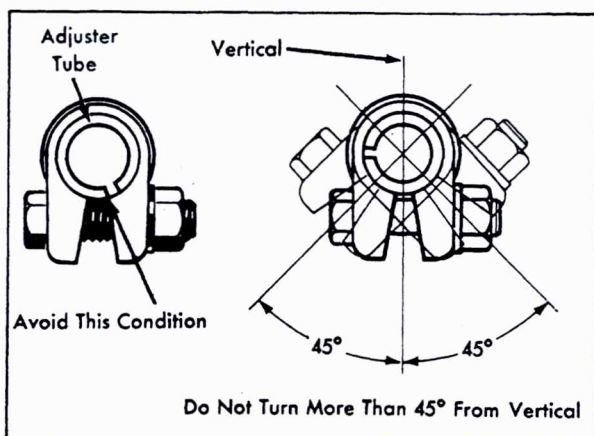


Fig. 3-7 Tie Rod Clamp Position

up and down. Gradually reduce the force you are applying until the car seeks its own level.

#### a. Front Springs

Measure the distance from the top of the lower control link in front of the rubber bumper to the flat surface on the bottom of the frame. Standing heights should be equal on both sides of car within 3/8 inch. If heights are unequal, it will be necessary to replace the spring on the low side.

See Page 4-17 for specifications for each series.

#### b. Ride Complaints

In case of hard riding, the first items to investigate are correct tire pressure, correct standing heights, and correct shock absorbers for the car. If these are correct, the amount of friction in the front suspension system should be checked.

The procedure for checking excessive friction in the front suspension is as follows:

1. Disconnect front shock absorbers.
2. With aid of a helper, lift up on the front bumper and raise the front end of the car as high as possible. Slowly release the bumper and allow the car to assume normal standing height. Measure distance from the floor to center of bumper. Then push down on bumper, release slowly, and allow car to assume normal standing height; again take measurement at same point on bumper.

If the difference between these two measurements is 1-1/4 inch or more, it indicates excessive friction in the suspension system. Probable causes could be damaged seals on the spherical joints, permitting dirt and water in the joints, bound up steering linkage, or excessive binding in the stabilizer bar mounting bushings.

### 3. Front Shock Absorbers

#### a. Removal

1. Raise hood and remove shock absorber upper retaining nut and retainer at upper suspension

arm frame mounting bracket. The shock absorber upper stem is square at the top so that it may be held by a wrench to prevent stem from turning when removing nut.

2. Remove bolt holding lower end of shock absorber to lower suspension arm.

3. Remove shock absorber through bottom of lower arm.

#### b. Installation

1. If new grommet is required, apply a small amount of silicone lubricant to grommet and force grommet through frame hole with a twisting motion.

2. Install retainer on shock absorber upper stem, and fully extend shock absorber rod.

3. Insert shock absorber assembly up into coil spring and guide stem through grommet. Then place lower end in position on lower suspension arm, and install bolt, lockwasher, and nut. Tighten nut to 40 foot-pounds.

4. Install retainer and nut on shock absorber upper stem, and tighten nut, holding stem from turning with wrench.

### 4. Checking Front Shock Absorbers

#### a. On Car Checks

1. Raise car.
2. Check for correct mounting of shock absorbers. If properly mounted, remove front shock absorbers from car.
3. Extend shock absorber and check to see if piston rod and seal (top of shock) cover is wet with a fresh film of oil. If oil is detected, check for a leak in the power steering hose, transmission cooler lines, etc.
4. If no oil is detected, pump shock absorber up and down by hand as fast as possible. If a skip is felt at end of stroke, proceed to bench check.
5. As another check, completely extend shock absorber and pull hard. If spring tension is felt, shock absorber should be replaced.

**IMPORTANT:** Pumping shock absorber by hand will not determine whether or not a shock absorber is good or bad. The best test method is to compare the questionable shock absorber with its mate on opposite side of car. If both front shocks feel the same, it is unlikely that a shock absorber replacement is necessary.

#### b. On Bench Checks

1. When performing a bench check for any suspected defective shock absorber, clamp shock absorber upside down in a vise.

**NOTE:** Cadillac shock absorbers can be turned upside down because all internal vapor (inert gas instead of air) is contained in a placell envelope which prevents aeration of oil and prevents lag.



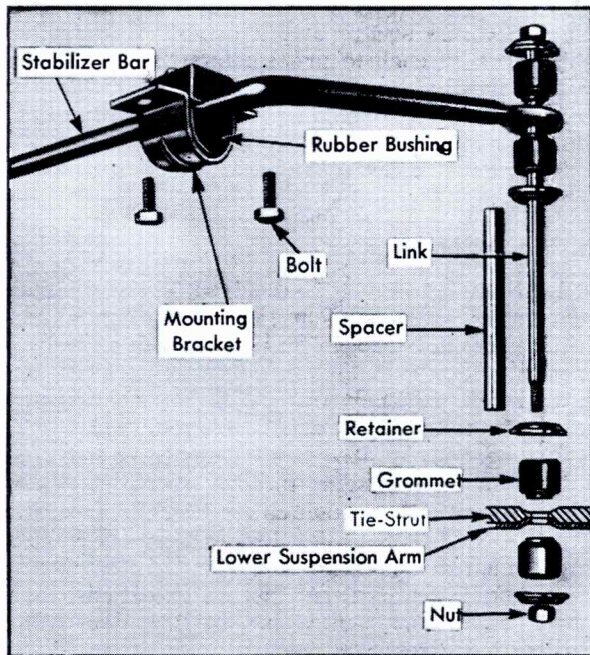


Fig. 3-8 Front Stabilizer Linkage

2. Pump shock absorber by hand at various rates of speed to find if shock absorber is defective. If a skip is felt at full extension when the shock is inverted, this is normal. A skip on reversal of direction in mid-travel indicates a ruptured pliacell envelope. If, however, smooth resistance is felt throughout length of the stroke, the shock absorber need not be replaced. A faint hiss ("orifice swish") is considered normal, but a gurgling noise denotes air bubbles in the fluid, and the shock absorber should be replaced.

## 5. Stabilizer Bar

### a. Removal

1. Remove nut, retainer, and grommet from bottom of each link Fig. 3-8.
2. Remove bolts from mounting brackets that hold stabilizer to frame, and remove brackets and stabilizer.
3. Remove rubber bushings from stabilizer bar, and remove grommets, retainers, spacers, and links from ends of stabilizer bar.

### b. Installation

1. Position stabilizer bar under front frame side rails and slide rubber bushings in place.
2. Install mounting brackets over rubber bushings and secure with bolts, Fig. 3-8. Tighten bolts to 20 foot-pounds.
3. Install grommets, retainers, links, and spacers on ends of stabilizer bar, making certain that retainers and grommets are arranged exactly as shown in Fig. 3-8.
4. Install grommet, retainer, and nut on bottom of each link. Tighten nut to end of threads.

## 6. Tie-Strut and Bushings

### a. Removal

1. Raise car.
2. Disconnect stabilizer link from lower arm on side from which tie-strut is to be removed.
3. Remove locknut, bushing retainer, and bushing from forward end of tie-strut, Fig. 3-9.
4. Remove two bolts securing tie-strut to lower suspension arm and remove strut.
5. Remove rear bushing, spacer, and retainer from tie-strut.
6. Remove rear locknut from tie-strut if necessary.

NOTE: If replacing only bushings, do not disturb rear locknut on tie-strut, otherwise it will be necessary to readjust caster and camber.

### b. Installation

1. If rear locknut was previously removed, install a new locknut (3/4 inch thick) on threaded end of tie-strut, and run nut approximately 3/4 inch from end of thread.
2. Install rear bushing retainer on tie-strut with concave side against nut.
3. Insert metal spacer part way through conical shaped bushing from small end, and install on tie-strut with small end toward front of car.
4. With tie-strut held in a horizontal position, install threaded end through frame front cross member.
5. Position opposite end of tie-strut on lower suspension arm with pointed end pointing inward, and install two attaching bolts and nuts loosely.
6. Install front bushing on end of tie-strut, cupped side toward frame, and slide bushing against frame cross member.
7. Install front bushing retainer on tie-strut with concave side against bushing, Fig. 3-9.
8. Start new locknut (5/8 inch thick) on threaded end of tie-strut.
9. Connect stabilizer link to lower suspension arm. Make certain that grommets and retainers are installed properly.
10. Lower car, and with car weight on all four wheels, position front bushing on metal spacer and tighten locknut on front end of tie-strut to 35 foot-pounds.
11. Tighten tie-strut to lower arm attaching bolt nuts to 55 foot-pounds.
12. If rear locknut was disturbed during tie-strut removal or installation, adjust caster and camber as described in Notes 1c and 1d.

## 7. Front Upper Suspension Arm Spherical Joint Seal Replacement (On Car)

1. Raise front end of car and place jack stands under lower suspension arms so that shock absorber lower mounts rest on jack stands.



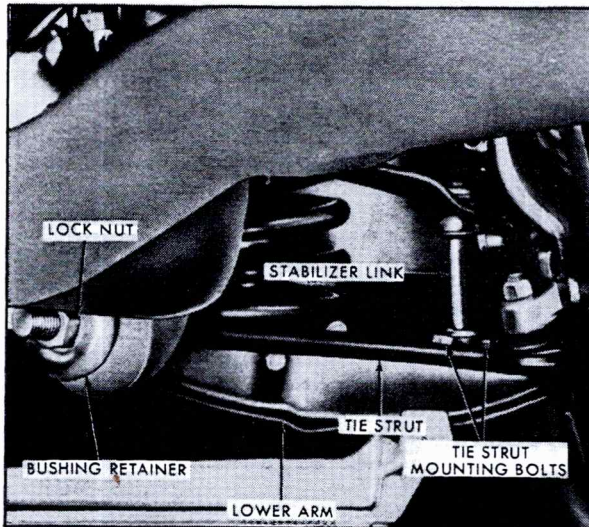


Fig. 3-9 Front Suspension Tie Strut

2. Remove wheel and tire assembly.
3. Remove locknut and special flat washer from spherical joint stud.
4. Scribe a mark on camber eccentric and steering knuckle to facilitate alignment at time of installation.
5. Remove joint from knuckle, using a 7/16 inch steel rod approximately 20 inches long, rounded on one end. Install a standard nut part way on stud and insert rounded end of rod inside nut. Strike end of rod with a heavy hammer until joint is free from steering knuckle, then remove standard nut.

**CAUTION:** Use extreme care to prevent the striking tool or hammer from slipping and hitting the brake line.

6. Raise up on upper arm and remove spherical joint from steering knuckle.
7. Remove camber eccentric from joint stud, using Puller, J-8990, Fig. 3-10.

**NOTE:** In cases where camber eccentric is seized or "frozen" to joint stud, remove upper suspension arm assembly, and remove camber eccentric as a bench operation.

8. Wipe outer seal surface clean to prevent any dirt from lodging in joint pivot when seal is removed.

9. Remove garter spring from top of seal and remove and discard seal and spring.

10. Clean joint pivot and stud thoroughly, removing all old grease and any dirt accumulation.

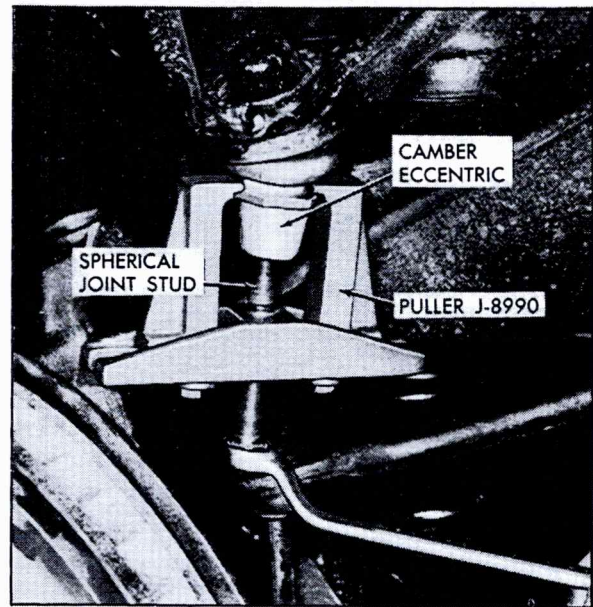


Fig. 3-10 Removing Camber Eccentric

11. Inspect ball pivot for looseness or binding, Note 11a. Joint should turn in its socket at 2 to 4 foot-pounds. If spherical joint is damaged or worn, replace joint and arm as an assembly.

12. Pry out service plug from spherical joint cover and discard plug.

13. Using Repacking Gun, J-9280, and Adapter J-9280-5, apply lubricant until approximately two teaspoons of lubricant escapes under the seal at the screwdriver, Fig. 3-11. Any water trapped in the joint should be forced out by the fresh lubricant.

**CAUTION:** Make certain that proper type lubricant is used when repacking suspension joints, as use of any other lubricant will contribute to premature failure.

14. Install new service plug in spherical joint cover.

15. Install new seal on spherical joint. Proceed as follows:

a. Compress seal on flat surface to pucker small hole of seal.

b. Place nylon ring over center of puckered hole, Fig. 3-12.

c. Press in on underside of seal, and press nylon ring until nylon ring seats itself in groove around hole. Continue to press seal until it assumes normal shape.

d. Apply a small amount of lubricant around hole in seal. Wipe groove in joint housing clean and install seal on joint stud. Make certain that large groove diameter of seal engages in recess (circular groove) around joint housing.

e. Allow air to enter seal by momentarily prying large lip of seal away from joint housing with a small screwdriver.



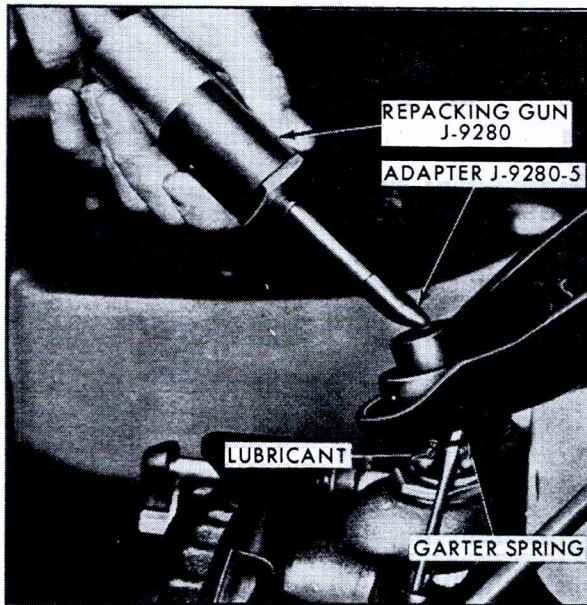


Fig. 3-11 Repacking Front Upper Spherical Joint Seal

f. Grasp small end of seal and extend toward threaded end of stud.

g. Install new garter spring on the smaller flanged surface of Spring Installer, J-9148, and lubricate inside diameter of installer with suspension lubricant.

h. Install spring on seal using Garter Spring Installer, J-9148, Fig. 3-13. Make certain that spring secures lip of seal in recess all around joint housing.

**NOTE:** If spring should separate where it is joined together, it is not an indication that the spring is broken. Join spring ends together and lock by twisting male end counterclockwise approximately 2-3 turns. Ends will thread into each other upon releasing.

16. Apply a light coating of grease on outside taper of camber eccentric and install camber eccentric on joint stud.

17. Thoroughly clean inside of steering knuckle and install joint stud and camber eccentric in steering knuckle, remembering to align scribe marks on eccentric and knuckle.

18. Install standard nut on joint stud and tighten nut until camber eccentric locks in knuckle; then remove standard nut and install special flat washer and new locknut, tightening to 60 foot-pounds.

19. Install wheel assembly, remove jack stands and lower car.

20. Check camber and adjust if necessary as described in Note 1c.

## 8. Repacking Front Lower Suspension Arm Spherical Joint Seal

1. Raise car.

2. Clean off all road deposits from affected lower spherical joint seal and remove plug at bottom of joint housing.

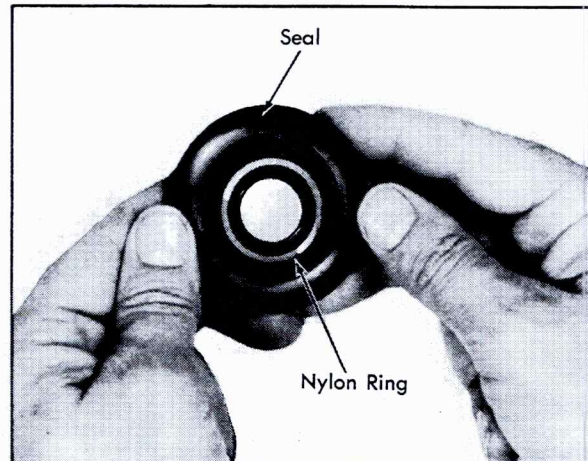


Fig. 3-12 Installing Nylon Ring on Seal

3. Using Repacking Gun, J-9280, and adapter J-9280-5, apply lubricant until grease is forced out between upper end of seal and knuckle, Fig. 3-14. Any water trapped in the joint should be forced out by the fresh lubricant.

**NOTE:** After removing repacking gun, allow some lubricant to escape through fitting to relieve seal pressure before installing plug.

4. Install new rubber plug.

5. Inspect seal for cuts, chafes, or pin holes. Escape of lubricant from any place other than top of seal indicates a damaged seal that should be replaced.

6. Repeat steps 2 through 5 on opposite side of car.

7. Lower car.

## 9. Front Lower Suspension Arm Spherical Joint Seal Replacement (On Car)

1. Raise front end of car and place jack stands under lower suspension arms approximately 2 inches inboard of spherical joints.

**CAUTION:** Jack stands must be used to prevent lower arm from swinging down when locknut is removed from joint stud.

2. Remove wheel assembly.

3. Remove locknut from lower spherical joint stud and install a standard nut on joint stud, running nut to within two threads of steering knuckle support. This nut will prevent lower arm from dropping down when joint stud is broken free of steering knuckle.

4. Raise front end of car slightly off jack stands with hydraulic jack.

5. Strike steering knuckle with a heavy hammer in area of spherical joint stud to break stud loose.

**CAUTION:** Use extreme care to prevent hammer from slipping and hitting the brake line.



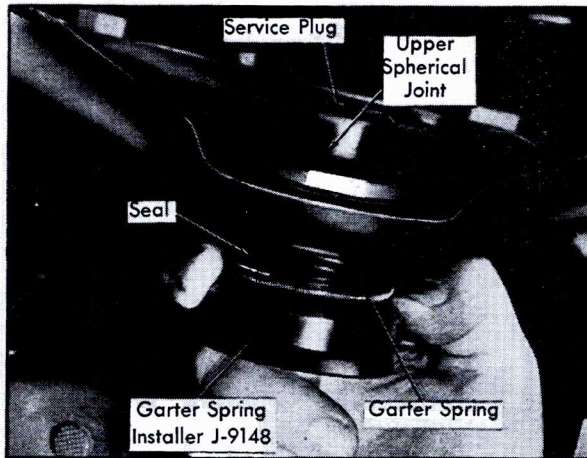


Fig. 3-13 Installing Spring on Upper Spherical Joint Seal

6. Lower car on jack stands, being certain that rebound bumper on upper arm clears frame, and remove standard nut from joint stud.

7. Raise up on upper arm and remove steering knuckle from lower joint stud.

8. Wipe outer seal surface clean to prevent any dirt from lodging in joint pivot when seal is removed.

9. Pry copper band off bottom of seal. Remove and discard seal and band.

10. Clean joint pivot and stud thoroughly, removing all old grease and any dirt accumulation.

11. Inspect ball pivot for looseness or binding, Note 11b. Free play should not exceed 1/16 inch as the joint operates vertically in its socket. Replace joint if it exceeds this limit.

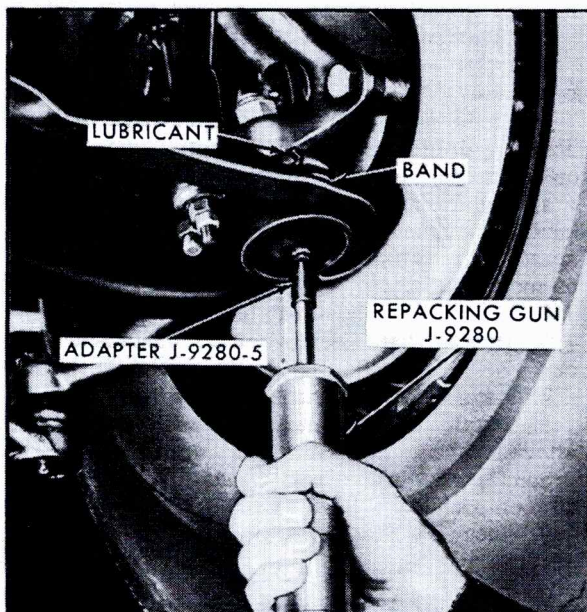


Fig. 3-14 Repacking Front Lower Spherical Joint Seal

12. Pry service plug from spherical joint and discard plug.

13. Using Repacking Gun, J-9280, and Adapter J-2980-5, Fig. 3-14, repack joint through plug hole with lubricant. Force lubricant into joint until enough comes through to flush out any moisture and foreign material. Usually one or two ounces will be needed. Wipe off surplus.

**CAUTION:** Be certain that only suspension lubricant is used.

14. Install new seal on spherical joint and secure band.

**CAUTION:** Spherical joint housing at point of seal contact must be completely dirt and grease free to insure a good seal when band is installed.

15. Install new service plug.

16. Guide spherical joint stud into steering knuckle support.

17. Install standard nut on joint stud and tighten nut until joint stud seats in steering knuckle support.

18. Remove standard nut and install locknut on joint stud, tightening to 65 foot-pounds.

**NOTE:** A large quantity of grease will purge from the upper end of joint because seal volume is reduced when installed in steering knuckle.

19. Install wheel and tire. Tighten wheel mounting nuts to 105 foot-pounds.

20. Replace wheel disc, remove jack stands and lower car.

## 10. Front Lower Suspension Arm Spherical Joint

### a. Removal

1. Remove lower suspension arm and coil spring as described in Note 14a.

2. Remove band and seal from spherical joint.

3. Using an arbor press, position Support, J-8999-7, on press anvil and place lower arm on Support with spherical joint cover resting in Support.

4. Position Spherical Joint Remover, J-8999-9, over joint stud until it seats on joint housing, Fig. 3-15, and press spherical joint out of arm.

### b. Installation

1. Using an arbor press, position Support, J-8999-7, on press anvil and place lower arm on Support, bottom side up, so that spherical joint mounting hole is encompassed by Support.

2. Insert new spherical joint in arm, stud end first, aligning joint housing with mounting hole.

3. Position Spherical Joint Installer, J-8999-5, on flanged portion of joint housing, Fig. 3-16, and press spherical joint into arm until joint flange bottoms on mounting hole flange.

4. Install lower suspension arm and coil spring as described in Note 14b.



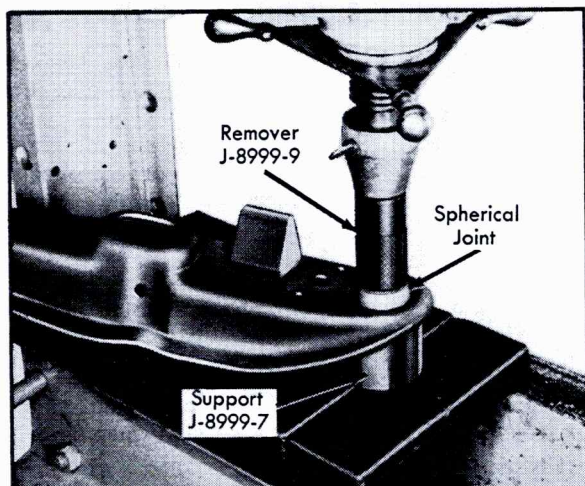


Fig. 3-15 Removing Spherical Joint From Lower Arm

## 11. Front Suspension Spherical Joint Checking Procedure

If spherical joints show signs of looseness or wear, they should be checked by following procedure after first disconnecting ball stud from steering knuckle.

### a. Upper Spherical Joint

Using regular spherical joint stud nut and a second nut as a locknut, turn joint in its socket with a torque wrench. It should read 2-4 foot-pounds. Replace a joint that is too loose or too tight.

### b. Lower Spherical Joint

The lower spherical joint is designed to turn freely in its socket and cannot be checked with a torque wrench. It should be checked by noting amount of free play as joint is worked vertically in its socket. Free play should not exceed 1/16 inch. Replace joint if it exceeds this limit.

NOTE: If joints are to be cleaned, use a clean cloth only. Do not use solvent.

## 12. Front Upper Suspension Arm

### a. Removal

1. Raise front end of car, place jack stands under lower suspension arms and remove wheel.
2. Remove locknut and special flat washer from upper spherical joint stud.
3. Remove brake hose to prevent damage to hose when removing spherical joint stud from steering knuckle.
4. Remove joint from knuckle using 7/16 inch steel rod approximately 20 inches long, rounded on one end. Thread a standard nut part way on stud and insert rounded end of rod inside nut. Then, using a heavy hammer, strike end of rod until joint is free from steering knuckle, Fig. 3-5.

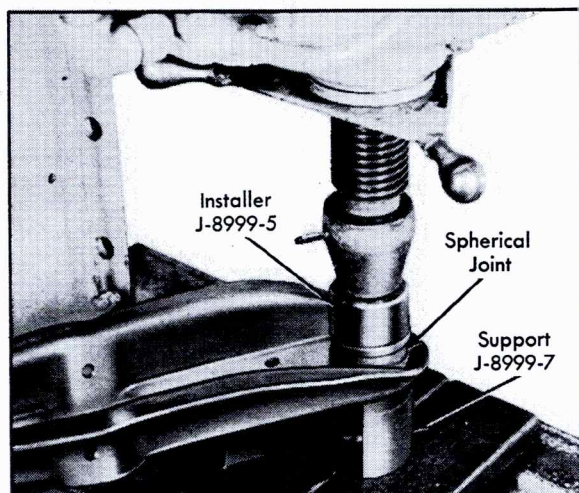


Fig. 3-16 Installing Spherical Joint in Lower Arm

5. Remove locknuts and shaft mounting bolts at frame tower, Fig. 3-17, and remove upper suspension arm and shaft assembly with heat shield attached.

6. Remove bolt, lockwasher, and flat washer from each end of shaft and remove ground strap.

7. Camber eccentric may be removed from spherical joint stud if necessary, by using Puller, J-8990.

NOTE: Do not attempt to remove spherical joint from upper suspension arm. Since it is welded to arm, any rewelding could damage joint seal or weaken arm. The upper arm and spherical joint are serviced as an assembly.

### b. Installation

1. Position upper arm assembly on frame tower with heat shield positioned over rear bushing and install mounting bolts and locknuts, Fig. 3-17. Tighten bolts to 60 foot-pounds.
2. Install camber eccentric on joint stud if previously removed.
3. Guide joint stud and camber eccentric into upper end of knuckle and install a standard nut on end of joint stud.
4. Tighten nut until camber eccentric locks in knuckle; then remove standard nut and install special flat washer and locknut. Tighten nut to 60 foot-pounds.
5. Install brake hose and bleed brakes.
6. Install wheel, remove jack stands and lower car.
7. Install ground strap on one end of arm.
8. Install flat washer, lockwasher and shaft attaching bolt on each end of shaft, securing ground strap under bolt head. Tighten bolts to 60 foot-pounds.
9. Check wheel alignment and adjust if necessary.

## 13. Front Upper Suspension Arm Shaft and Bushings

It will be necessary to make two spacers from



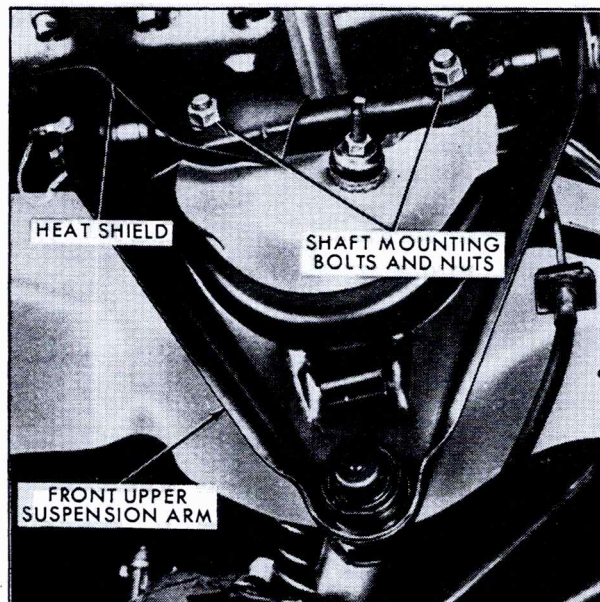


Fig. 3-17 Upper Arm and Shaft Assembly Installed

cold rolled steel or similar material to facilitate removal of bushings from shaft. Dimensions of the spacers are shown in Fig. 3-18. Also provide two 1/2 inch x 2 inch bolts with nuts to hold spacers in position around shaft.

#### a. Removal

1. Remove bolt, lockwasher, and flat washer from each end of shaft and remove ground strap.
2. Install spacers on shaft between arm ends. Secure spacers to shaft with bolts and nuts, Fig. 3-19.
3. Apply a liberal amount of penetrating oil between bushing sleeve and arm.
4. Position Support, J-8999-2, on anvil of arbor press and place one end of arm on support with outer end of bushing resting in support.
5. Insert Driver, J-8999-6, through bushing in opposite arm and thread Driver into end of shaft.
6. Drive shaft downward until spacer plates touch extruded flanges of control arm, Fig. 3-19.
7. Remove arm assembly from arbor press. Remove Driver, insert on opposite end, and repeat steps 4 and 5.
8. Remove arm assembly from arbor press and remove Driver.
- If necessary, tap end of bushing with hammer to complete its removal. Also tap in opposite direction to complete shaft removal from suspension arm.
9. Place end of shaft in vise with sleeve extending above vise jaws. Then place a bolt or drift pin against inner side of sleeve and hammer sideways, expanding split sleeve to aid in removal.
10. Remove remaining bushing either by driving out in vise, or by pressing out in arbor press.
11. Remove remaining sleeve in same manner.
12. Remove spacers from shaft.

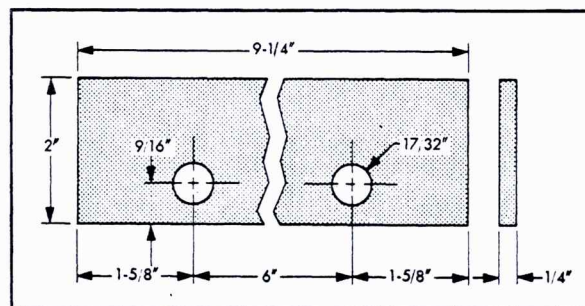


Fig. 3-18 Bushing Remover Spacer

### 14. Front Lower Suspension Arm and Coil Spring

#### a. Removal

1. Disconnect front shock absorber at its upper mount.
2. Raise front end of car and place jack stands under front frame side rails.

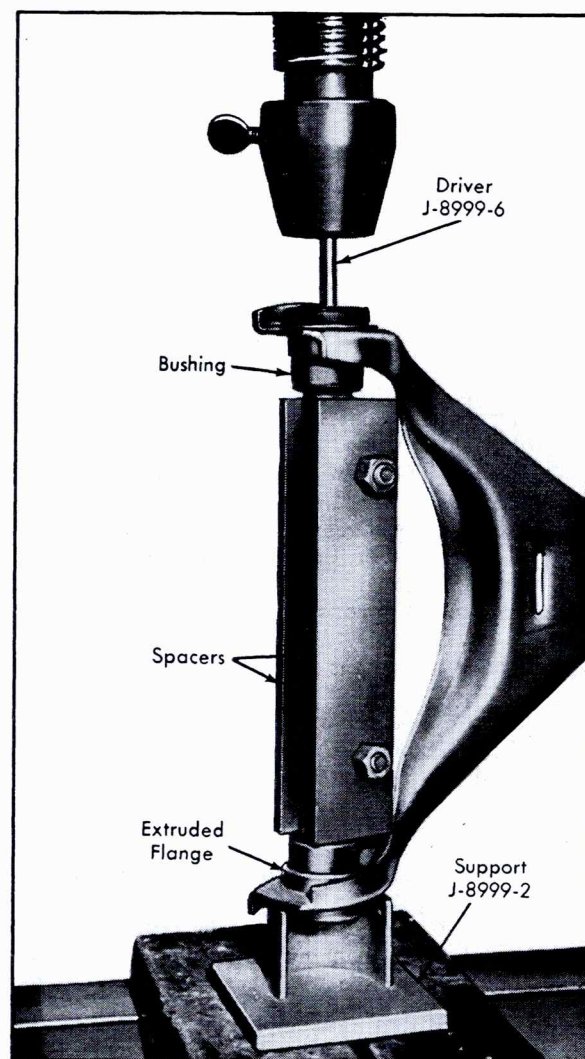


Fig. 3-19 Removing Bushing From Upper Arm



3. Disconnect stabilizer link from lower arm that is to be removed.
4. Disconnect tie-strut at lower arm.
5. Remove bolt securing shock absorber to lower arm and remove shock absorber.
6. Remove wheel assembly.
7. Remove nut from pivot bolt in lower arm at frame mount.
8. Position hydraulic jack under outboard end of lower suspension arm so that jack is supporting arm.
9. Remove locknut from lower spherical joint stud. Install standard nut on joint stud and run nut to within two threads of knuckle.

NOTE: Nut will prevent lower arm from dropping when joint stud is broken free of steering knuckle.

10. Strike knuckle with a hammer in area of spherical joint stud to break joint loose. To facilitate removal of joint stud from knuckle, raise opposite rear corner of car to help compress spring.

CAUTION: Use extreme care to prevent hammer from slipping and hitting the brake line.

11. Use jack to lift spring load from nut and remove nut from joint stud.
12. Slowly lower jack and remove spring.
13. Remove pivot bolt from lower arm at frame mount and remove arm.

#### b. Installation

1. Position Bushing Installer, J-8999-16 (part of Bushing Installer Set, J-8999-15), on arbor press anvil.
2. Insert bushing in one end of arm and place arm and bushing on Bushing Installer, with outer end of bushing seated in Installer, Fig. 3-20.
3. Place shaft between arm ends, aligning end of shaft with bushing inner sleeve.
4. Position bushing on opposite end of shaft, and place the other Bushing Installer, J-8999-16, on top of bushing. Hold assembly in place by exerting slight pressure on arbor press, Fig. 3-20.
5. Check alignment of bushings, arm ends, and shaft.
6. Install Spacer, J-8999-1, around shaft between arm ends to prevent arms from collapsing when bushings are installed.
7. Using arbor press, press bushing onto shaft until both bushing flanges bottom on arms.

NOTE: It is possible that both bushing inner sleeves may not butt flush against shaft shoulder. However, when bushing attaching bolts are tightened, bushing inner sleeves will seat themselves.

8. Remove arm assembly and installer tools from arbor press, and remove spacer tool.
9. Install ground strap on one end of arm.
10. Install flat washer, lockwasher, and bolt

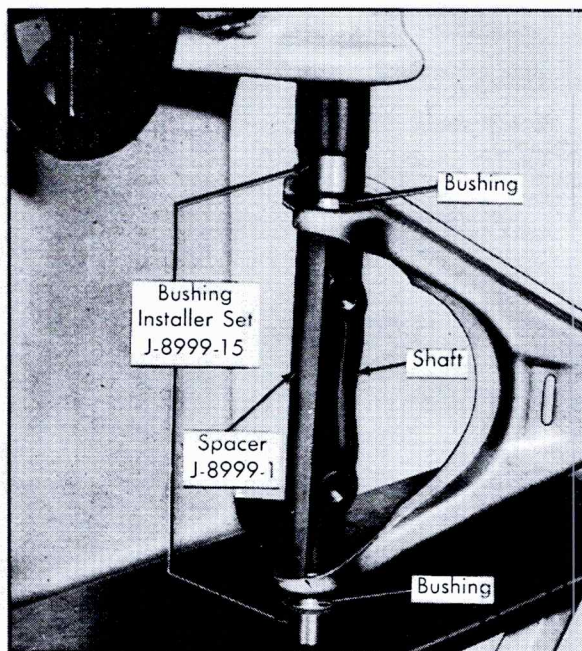


Fig. 3-20 Installing Shaft and Bushing In Upper Arm

on each end of shaft, securing ground strap under bolt head.

NOTE: Do not torque bolts until arm assembly is installed on car. Proper torque for these bolts is 60 foot-pounds with car on ground.

#### b. Installation

1. Position inboard end of lower arm in frame mount and install pivot bolt. Do not install nut at this time.
2. Install end of spring in upper seat of frame. If working with left spring, rotate spring until end is flush with front of lower control arm, Fig. 3-21. If working with right spring, end should be flush with rear of right control arm.

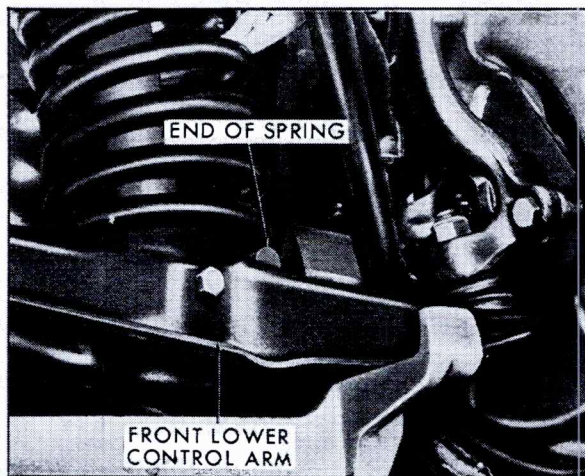


Fig. 3-21 Locating End of Spring



NOTE: Raised edge on top of arm faces front of car on right side and rear of car on left side.

3. With aid of a helper and with jack placed under lower arm, Fig. 3-22, raise arm into position. Spring may have a tendency to rotate as arm is raised, mispositioning spring. Top of spring must seat within the five depressions on frame tower, and bottom end must be flush to one inch back of the front of left lower arm, or flush to one inch forward of the back of right lower arm.

4. Guide spherical joint stud into steering knuckle.

5. Install standard nut on joint stud and tighten nut until joint stud seats in knuckle.

6. Remove standard nut and install locknut on joint stud, tightening to 65 foot-pounds.

7. Install nut on lower suspension arm pivot bolt. Do not tighten this nut until car is on all four wheels.

8. Insert shock absorber assembly up into coil spring and guide stem through tower in frame cross member. Place lower end in position on lower suspension arm. Install pivot bolt, lock-washer, and nut. Do not tighten nut until car is on all four wheels.

9. Install tie-strut on lower arm, securing with two bolts and nuts. Tighten nuts to 35 foot-pounds.

10. Connect stabilizer link to lower arm.

11. Install wheel assembly.

12. Replace wheel disc and lower front end of car.

13. Connect shock absorber at its upper mount.

14. Tighten nut on lower suspension arm pivot bolt to 60 foot-pounds.

15. Tighten nut at shock absorber lower mount in lower arm to 60 foot-pounds.

16. Check wheel alignment and adjust if necessary.

## 15. Front Lower Suspension Arm Bushing

### a. Removal

1. Remove lower suspension arm and coil spring as described in Note 14a.

2. Use a stiff wire brush to clean the small outer diameter end of the bushing and the portion of the bushing between the legs of the arm.

NOTE: This step will help prevent corrosion on the bushing outer sleeve from gouging grooves in the arm upon removal.

3. Position Support, J-8999-2, on arbor press anvil and insert larger diameter end of bushing in Support.

4. To prevent lower arm from collapsing when bushing is pressed out, place Spacer J-8999-20 around inner flange of lower control arm. Inner flange is located on larger diameter bushing side.

5. Position Bushing Remover, J-8999-10, on sleeve, Fig. 3-23 and press bushing out of arm.

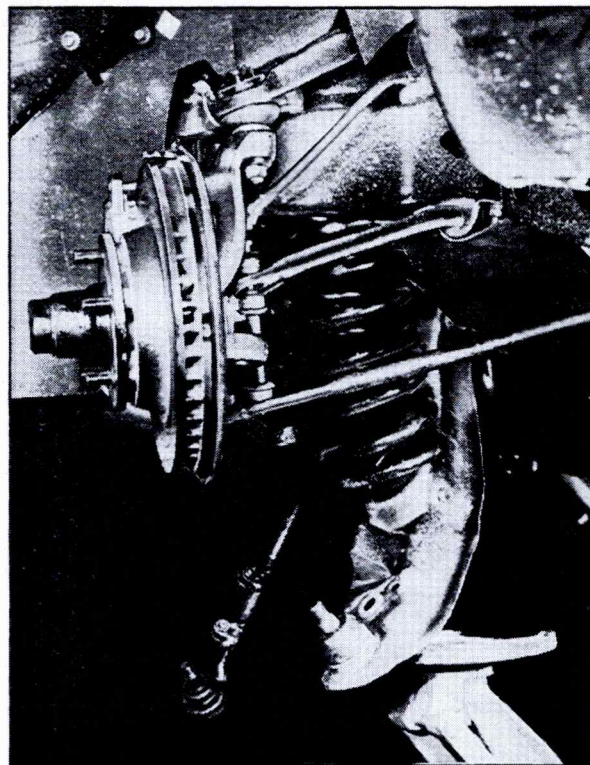


Fig. 3-22 Coil Spring Installation

6. Inspect bushing holes in front lower control arm for distortion or gouges in holes. If arm is damaged, it will be necessary to replace the front lower control arm as an assembly.

### b. Installation

1. Position Support, J-8999-2, on arbor press anvil and insert smaller diameter flanged end of bushing mount in Support.

2. Install new bushing in arm, smaller diameter end of bushing first, until bushing pilots itself in opposite flanged end.

3. Place Spacer, J-8999-20, around inner flange of lower control arm.

4. Place Bushing Installer, J-8999-16, on Support, J-8999-2, Fig. 3-24.

5. Position Bushing Installer, J-8999-9, over end of bushing and press bushing into arm until the end of the inner sleeve bottoms on Bushing Installer, J-8999-16.

6. Install lower suspension arm and coil spring as described in Note 14b.

## 16. Steering Knuckle

### a. Removal

1. Raise front end of car and place jack stands under front frame side rails.

2. Remove wheel assembly.

3. Remove caliper as described in Section 5, Note

4. Remove dust cap, cotter pin and spindle nut.



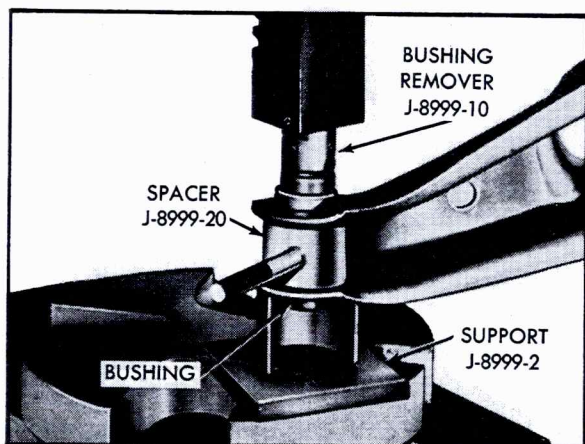


Fig. 3-23 Removing Bushing From Lower Arm

5. Remove hub and disc, Fig. 3-25.
6. Remove two bolts from back side of steering knuckle and one bolt from front of splash shield. Then, remove splash shield, support plate, seal and steering arm from steering knuckle.
7. Place jack under lower suspension arm on side from which steering knuckle is to be removed.
8. Remove locknut from lower joint stud and strike knuckle support with a mallet in area of joint stud to break joint loose.

CAUTION: Use extreme care to prevent mallet from slipping and hitting the brake line.

9. Remove locknut and special flat washer from upper spherical joint stud.
10. Remove joint from knuckle using a 7/16 inch steel rod approximately 20 inches long, rounded on one end. Thread a standard nut part way on

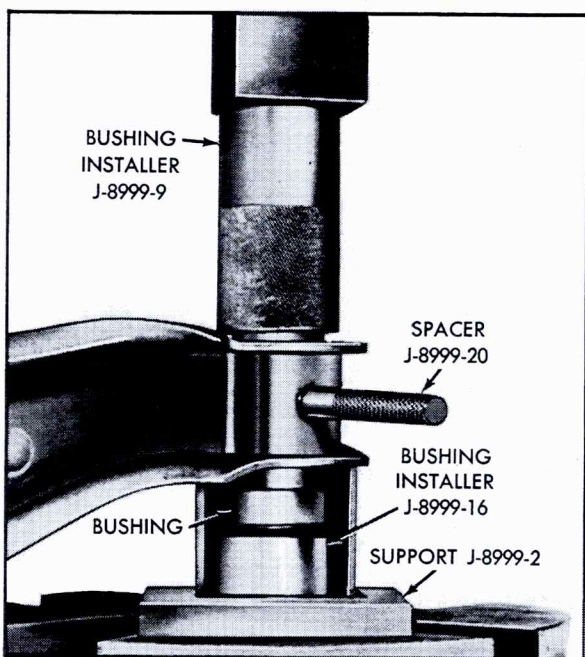


Fig. 3-24 Installing Bushing In Lower Arm

stud and insert rounded end of rod inside nut. Then, using a heavy hammer, strike end of rod until joint is free from steering knuckle.

CAUTION: Use extreme care to prevent hammer from slipping and hitting the brake line.

11. Raise up on upper arm and remove joint stud from upper steering knuckle support.
12. Remove steering knuckle from lower joint stud.

### b. Installation

1. Guide upper joint stud into steering knuckle upper support and install a standard nut on joint stud. Tighten nut until camber eccentric locks in knuckle, then remove standard nut and install special flat washer and locknut, tightening to 60 foot-pounds.
2. Guide lower spherical joint stud into steering knuckle lower support.
3. Install standard nut on joint stud and tighten until stud locks in knuckle, then remove standard nut and install locknut, tightening to 65 foot-pounds.
4. Install two bolts through lower end of steering knuckle, with bolt heads against mounting boss of steering knuckle, Fig. 3-25.
5. Position steering arm on bolts just installed in steering knuckle.
6. Position seal, support plate and splash shield on steering knuckle spindle. Install washers and nuts and tighten nuts to 45 foot-pounds.
7. Install bolt through splash shield and support plate to secure them to upper end of steering knuckle. Tighten bolt to 125 foot-pounds, and bend locking tang over flat on nut.
8. Install hub and disc on spindle.
9. Install washer and spindle nut. See Note 18, for wheel bearing adjustment.
10. Install caliper as described in Section 5, Note
11. Install wheel and tire.
12. Install dust cap and wheel disc and lower car.
13. Check wheel alignment and adjust if necessary.

## 17. Steering Arm

### a. Removal

1. Raise front end of car and place jack stands under front frame side rails.
2. Remove wheel assembly.
3. Remove caliper as described in Section 5, Note
4. Remove dust cap, cotter pin and spindle nut.
5. Remove hub and disc.
6. Remove two bolts securing splash shield and support plate to lower end of steering knuckle.
7. Remove bolt securing splash shield and support plate to upper end of steering knuckle, and remove splash shield and support plate.

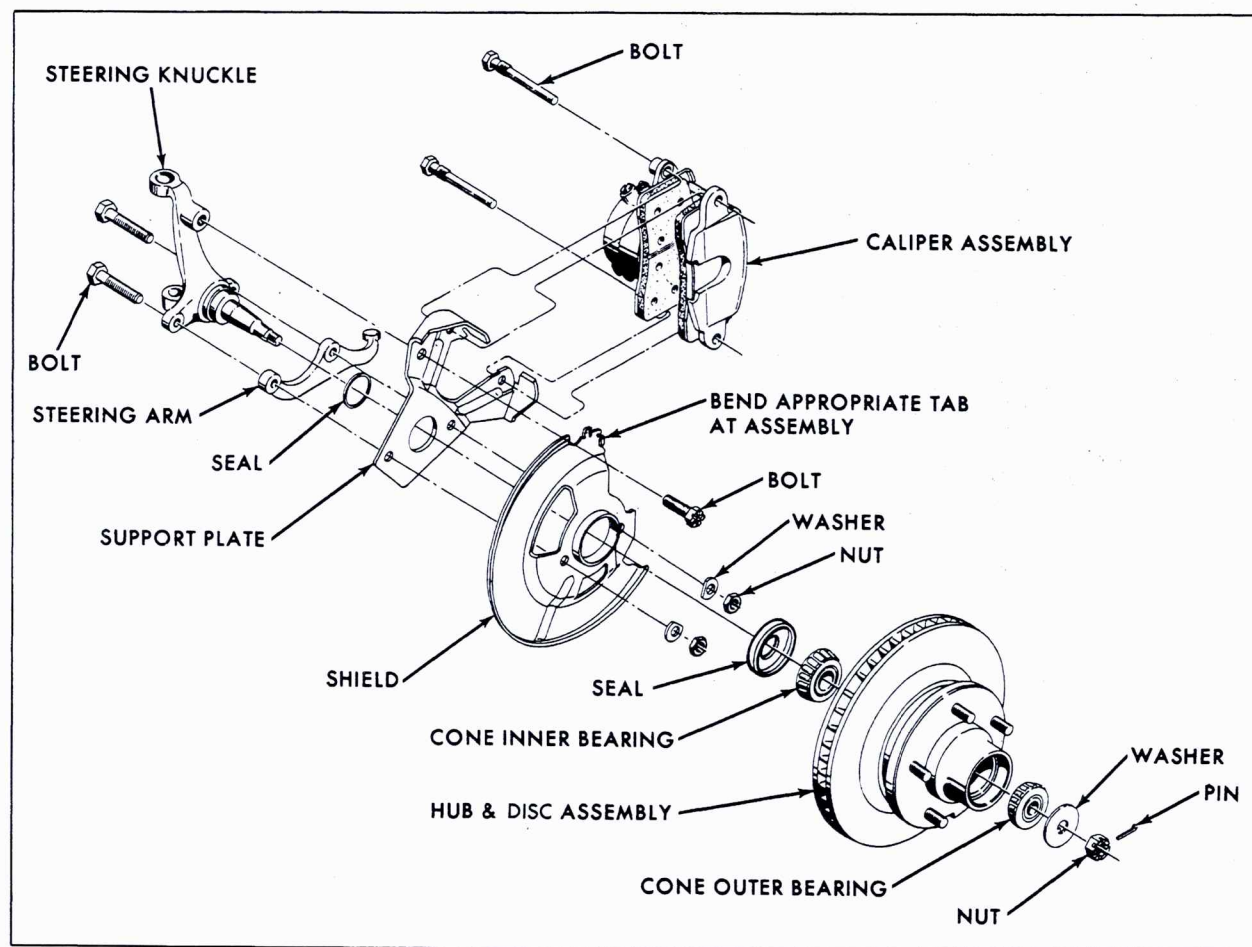


Fig. 3-25 Front Wheel Disassembled

8. Remove tie-rod joint stud from steering arm, using Tie-Rod End Puller J-21930, Fig. 3-26, and remove steering arm.

#### b. Installation

1. Install two bolts through lower end of steering knuckle.

NOTE: Install bolts with bolt heads against mounting boss of steering knuckle, Fig. 3-25.

2. Position steering arm on bolts previously installed in steering knuckle.

3. Position seal, support plate and splash shield on steering knuckle spindle. Install washers and nuts. Tighten nuts to 65 foot-pounds.

4. Install bolt through splash shield and support plate to secure them to upper end of steering knuckle. Tighten bolt to 125 foot-pounds, and bend locking tang over flat on nut.

5. Install tie-rod end joint stud in steering arm and secure with nut, tightening to 40 foot-pounds. Install cotter pin.

6. Install caliper as described in Section 5, Note

7. Install hub and disc assembly on spindle.

8. Install washer and spindle nut. See Note 18, for wheel bearing adjustment.

9. Install wheel assembly on hub and tighten mounting nuts to 105 foot-pounds.

10. Replace dust cap and wheel disc, and lower car.

11. Check wheel alignment and adjust if necessary.

## 18. Wheel Bearings

### a. Front Wheel Bearing Adjustment

Tapered roller bearings are used in the front wheels, Fig. 3-25.

When adjusting front wheel bearings, raise front end of car and make sure that hub is completely seated on spindle. Rotate wheel assembly while tightening the adjusting nut to 30 foot-pounds, using a 0-50 foot-pound torque wrench. Make certain that all parts are properly seated and the threads are free. Then back off nut to 0. Next, tighten nut to 6 foot-pounds.

If nut slot lines up with cotter pin hole, install cotter pin. If not, back nut off to next hole. Do not tighten nut over 6 foot-pounds.



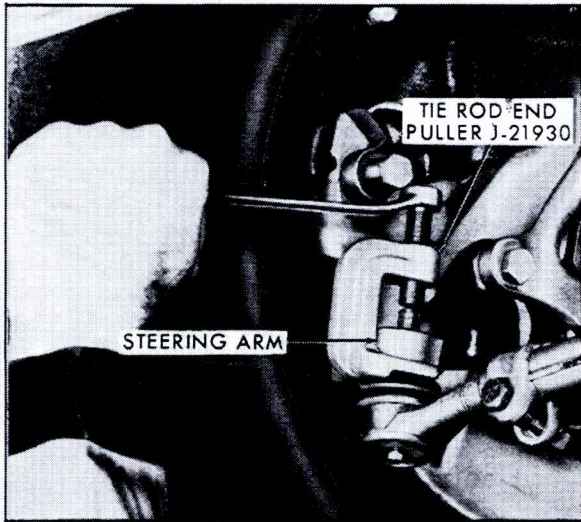


Fig. 3-26 Removing Tie Rod Joint Stud From Steering Arm

NOTE: There are two cotter pin holes in spindle.

Peen end of cotter pin over against side of nut. The cotter pin must be tight after installation. If cotter pin can be moved with finger vibration may cause it to wear and break, ending its protection.

#### b. Front Wheel Bearing Removal

1. Remove wheel disc.
2. Raise front end of car.
3. Remove wheel assembly from hub.
4. Remove caliper as described in Section 5,

Note

5. Remove dust cap, cotter pin, spindle nut, washer, and outer cone and roller assembly, Fig. 3-25.

6. Remove hub and disc from steering knuckle spindle.

7. Remove inner bearing grease retainer, and bearing cone and roller assembly.

NOTE: A simple tool, Fig. 3-27, may be made out of cold rolled steel or from an old screwdriver to facilitate removal of the grease retainer. Use of this tool will prevent possible damage to inner bearing assembly and hub surface when removing retainer.

8. Inner and outer bearing cups are a press fit in hub, and can be removed by driving out from opposite side with a long brass drift.

NOTE: Discolored stripes on bearing races of new cars do not necessarily indicate a rough bearing race.

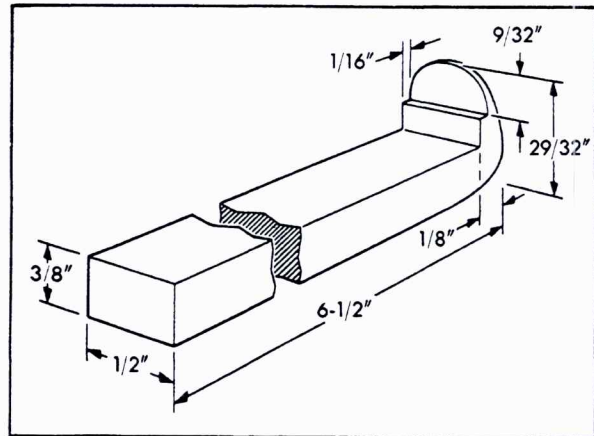


Fig. 3-27 Grease Retainer Remover Tool

#### c. Front Wheel Bearing Installation

1. Clean cone and roller assemblies and cups thoroughly, replacing the complete assembly if any parts are worn, pitted, or rough.

2. Pack bearing cages with high melting point grade 2 grease. Use a commercial bearing packer or pack bearings by hand. Force grease in at

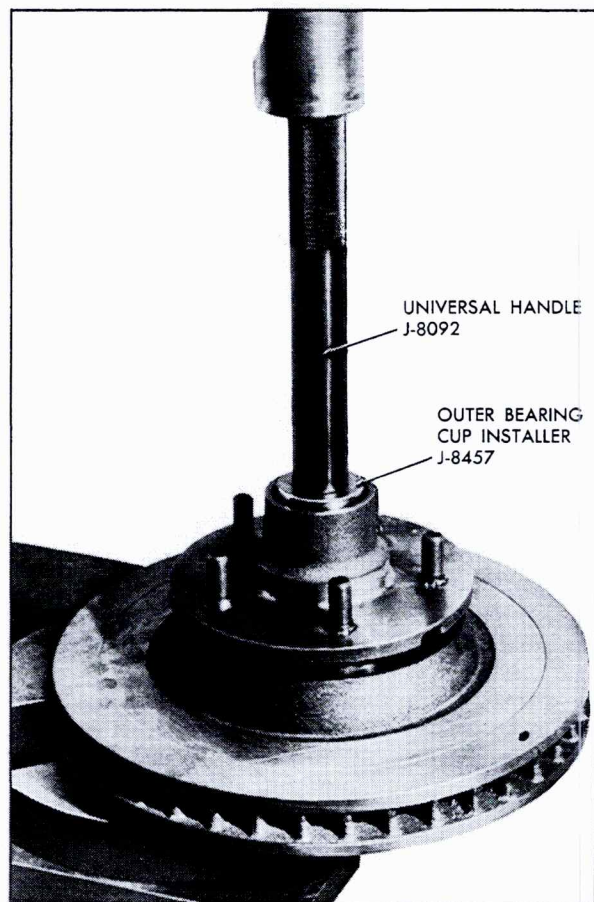


Fig. 3-28 Installing Outer Bearing Cup

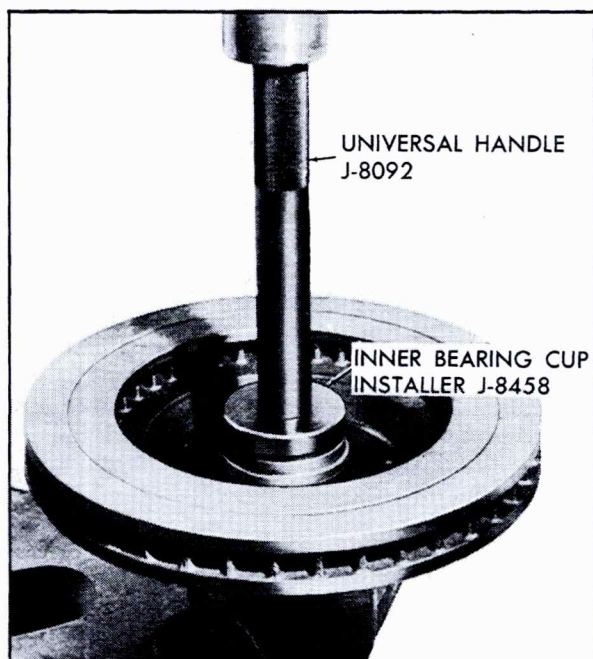


Fig. 3-29 Installing Inner Bearing Cup

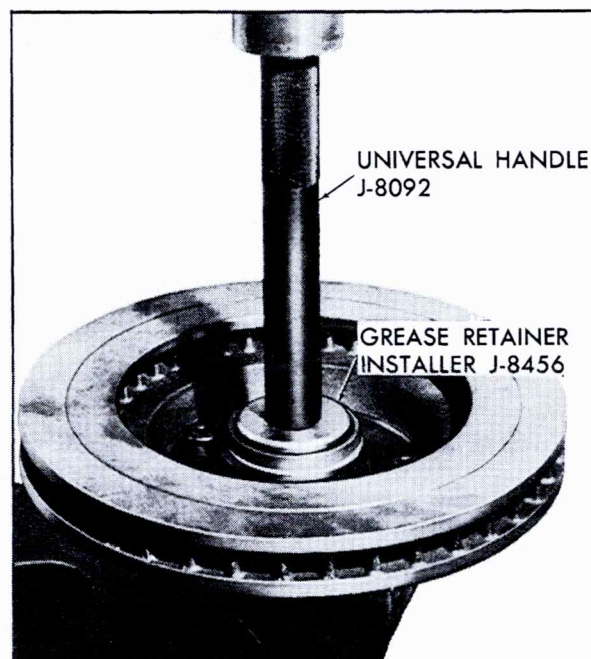


Fig. 3-30 Installing Grease Retainer

large end of cage until it protrudes from the small end.

3. Install outer bearing cup, using Front Hub Outer Bearing Cup Installer, J-8457, and Handle, J-8092. Use arbor press to install bearing cup in hub, Fig. 3-28.

4. Install inner bearing cup, using Front Hub Inner Bearing Cup Installer, J-8458, and Handle, J-8092. Use arbor press to install bearing cup in hub, Fig. 3-29.

5. Place inner bearing cone and roller assembly in inner bearing cup.

6. Install new grease retainer, using Front Wheel Hub Grease Retainer Installer, J-8456, and Handle, J-8092. Use arbor press to install grease retainer in hub, Fig. 3-30.

7. Wipe steering knuckle spindle clean and apply a thin film of wheel bearing grease to spindle.

8. Install hub and disc on steering knuckle spindle.

9. Place outer bearing cone and roller assembly in outer bearing cup.

10. Install washer, spindle nut and cotter pin.

11. Install caliper as described in Section 5, Note

12. Install wheel assembly on hub and tighten wheel mounting nuts to 105 foot-pounds.

13. Replace dust cap and wheel disc and lower car.

## 19. Bent Parts Straightening

The straightening of bent parts in the front suspension system should be attempted only within the following limits.

Parts should be replaced rather than straightened if they are sprung out of alignment more than five degrees. Excessive bending of parts when cold may result in stresses or cracks invisible to the naked eye, which make the part unsafe for use. Straightening with heat will destroy the effect of previous heat treatment, leaving the steel seriously weakened.

Welding of parts subjected to high stresses should never be attempted, because the welding process will change the grain structure of the metal, making it unsafe.



## FRONT SUSPENSION DIAGNOSIS CHART

CONDITION	CAUSE	CORRECTION
Car pulls to one side.	Drag link height not properly adjusted. Uneven tire pressure. Uneven tire wear. Brakes grabbing. Uneven caster or camber. Rear wheels not tracking with front wheels. Wheel bearings adjusted too tight. Front springs sagging. Upper or lower suspension arm mounting bolts loose. Steering arm bent. Frame bent or broken. Steering gear valve off center.	Adjust drag link height. Inflate tires to proper pressure. Interchange tires. Clean and adjust. Check and adjust caster or camber as necessary. Check alignment of rear wheels with front wheels. Check for binding with front wheels off floor. Adjust and lubricate bearings. Check spring height and replace if necessary. Tighten to specified torque. Replace with new arm. Check frame for proper alignment or breakage. Repair or replace as necessary. Install new valve assembly.
Scuffed tires.	Toe-in incorrect. Excessive speed on turns. Tires improperly inflated. Wheels or tires out of round. Suspension arm bent or twisted.	Adjust toe-in to specifications. Advise driver. Inflate tires to proper pressure. Check for wheel and tire wobble. See that wheels and tires are properly mounted. Replace wheels or tires if necessary. Replace arm.
Cupped tires.	Excessive tire or wheel runout. Tires improperly inflated. Wheels or tires out of balance. Front shock absorbers inoperative. Worn upper spherical joints. Worn lower spherical joints. Incorrect drag link height. Wheel bearings incorrectly adjusted or worn.	Compensate for runout as explained in Section 10. Inflate tires to proper pressure. Balance wheels and tires. Replace shock absorbers. Replace arm assembly. Replace joints. Correct according to specifications. Adjust or replace bearings as necessary.
Front wheel shimmy.	Wheels or tires out of balance. Wheels or tires out of round.	Balance wheels and tires. Check for tire and wheel wobble or out of round. See that wheels and tires are properly mounted.

**FRONT SUSPENSION DIAGNOSIS CHART (Cont'd.)**

CONDITION	CAUSE	CORRECTION
Front wheel shimmy (cont'd.)	Rough tire. Steering gear or steering connections incorrectly adjusted or worn. Worn spherical joints. Damaged spherical joint seals. Front wheel bearings incorrectly adjusted or worn. Shock absorbers inoperative.	Isolate and replace. Check and adjust to specifications. Replace lower joints and/or upper arm assembly. Replace and repack seals. Adjust or replace if necessary. Check and replace if necessary.
Car wanders.	Steering gear or connections adjusted too loose or worn. Drag link height incorrect. Worn spherical joints. Toe-in or caster incorrectly adjusted. Tires which are not original equipment. Excessive friction in front suspension. Front standing height incorrect. Upper or lower suspension arm mounting bolts loose.	Adjust or install new parts as necessary. Check and adjust to specifications. Replace lower joints and/or upper arm assembly. Adjust toe-in and caster. Install original equipment. Check spherical joint seals for damage. If necessary, replace seals and repack joints. Check standing height and adjust as necessary. Tighten to specified torque.
Road shock.	High tire pressure. Steering gear or connections incorrectly adjusted. Shock absorbers inoperative. Front springs weak or sagging. Non-standard or incorrect size tires used.	Deflate tire to proper pressure. Adjust steering gear and connections. Check shocks and replace if necessary. Check spring height and replace if necessary. Install new tires of correct size and type.
Hard riding.	Excessive friction in front suspension. Tires overinflated. Shock absorbers. Springs with incorrect rating being used.	Check spherical joint seals for damage. If necessary, replace seals and repack joints. Correct tire pressure. Check and replace if necessary. Install springs with correct rating.



**TORQUE SPECIFICATIONS (EXCEPT 693)**

Material No.	Application	Size	Foot-Pounds
300-M	Upper bolt, splash shield and support plate to steering knuckle . . . . .	9/16-18	100
301-M	Steering knuckle and arm to support plate and splash shield . . . . .	1/2-20	60
380-M	Spherical joint to knuckle (lower) . . . . .	5/8-18	65
301-M	Spherical joint to knuckle (upper) . . . . .	1/2-20	60
260-M	Stabilizer bracket to frame attaching bolts . .	3/8-24	20
301-M	Suspension arm shaft to frame bolts (upper).	1/2-20	60
300-M	Suspension arm shaft attaching bolts (at bushings) 1-1/4" . . . . .	3/8-24	60
301-M	Suspension arm to frame (lower) . . . . .	1/2-20	60
301-M	Front shock absorber to lower arm nut . .	7/16-14	60
286-M	Tie rod adjuster clamp nuts . . . . .	3/8-24	20
286-M	Tie rod pivots to steering arms . . . . .	1/2-20	40
301-M	Tie-strut to lower arm . . . . .	7/16-20	60
301-M	Tie-strut to frame at front bushing. . . . .	3/4-16	35

NOTE: Refer to back of Manual, Page 16-1, for bolt and nut markings, and steel classifications.

**FRONT COIL SPRING CHART**

Style	Color or Code*	Normal Load	Rate Per Inch
68069, 68169 (Without Automatic Climate Control)	Brown - BD	2850	375 - 395 lbs.
68069, 68169 (With Automatic Climate Control)	Green - BE	2900	375 - 395 lbs.
68249, 68349, 68369 (Without Automatic Climate Control)	Yellow - BB	2800	375 - 395 lbs.
68249, 68349, 68369 (With Automatic Climate Control)	Green - BE	2900	375 - 395 lbs.
68247, 68347, 68367 (With Automatic Climate Control)	Brown - BD	2850	375 - 395 lbs.
68247, 68347, 68367 (Without Automatic Climate Control)	Lt. Blue - BA	2750	375 - 395 lbs.
69723, 69733	Orange - BG	3180	472 - 498 lbs.
69890	Gray - BC	3100	582 - 618 lbs.
HEAVY DUTY			
All but 69723, 69733, 69890	Dk. Blue - BH	3015	418 - 442 lbs.
69723, 69733, 69890	Dk. Green - BJ	3380	642 - 678 lbs.

\*Springs may be identified by a color daub, code letters or both.





Fig. 3-31 Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-8999	Front Suspension Service Set	F	J-9280-5	Repacking Gun Adapter
A1	None	Bushing Remover Spacer (2)	G	J-9148	Garter Spring Installer
B	J-21930	Tie Rod End Puller	H	J-8999-20	Spacer
C	J-8990	Puller Front Suspension	I	J-8092	Universal Handle
D	J-5680-01	Crow Foot Adapter	J	J-8456	Front Hub Grease Retainer Installer
E	J-9280	Repacking Gun (Spherical Joints)	K	J-8458	Front Hub Inner Bearing Cup Installer
			L	J-8457	Front Hub Outer Bearing Cup Installer



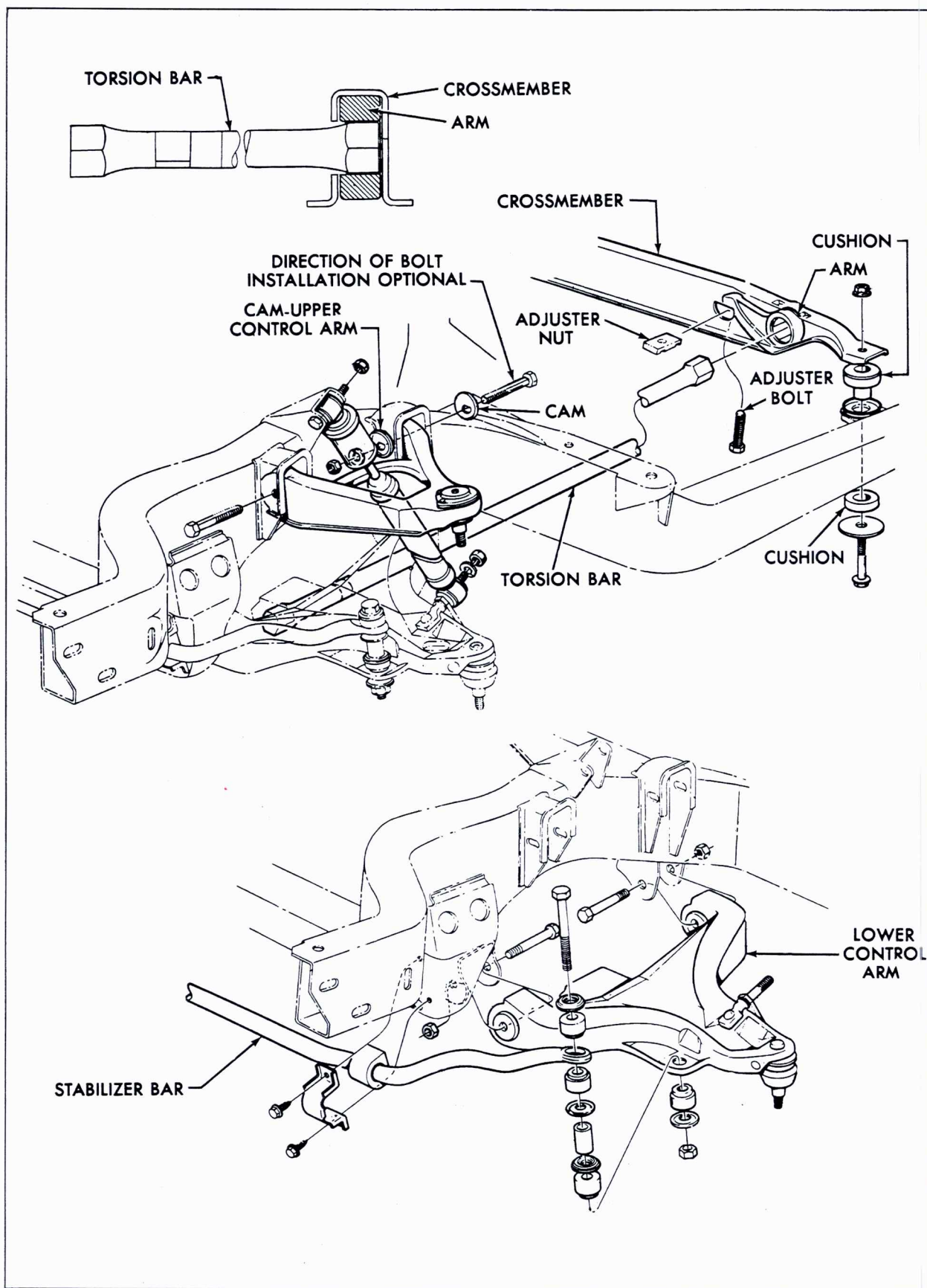
**FRONT SUSPENSION ELDORADO**

Fig. 3-32 Front Suspension Disassembled Eldorado

## FLEETWOOD ELDORADO

### GENERAL DESCRIPTION

The service information that follows pertains only to the Fleetwood Eldorado. All other service procedures and recommendations for the Eldorado are the same as those for the standard car, as given in the first part of this section.

The front suspension on the Fleetwood Eldorado (693 Series), consists of two upper and two lower control arms, a stabilizer bar, shock absorbers and a right and left torsion bar, Fig. 32. Torsion bars are used instead of the conventional coil springs. The front end of the torsion bar is attached to the lower control arm. The rear of the torsion bar is mounted into an adjustable arm in the torsion bar cross member. The standing height of the car is controlled by this adjustment.

**CAUTION:** If any mispositioning, incorrect assembly, or failure of components in the area of the brake system pipes, hoses, or cylinders is observed, be sure to check for any brake damage that may have resulted from such a condition, and correct as required. Components that could damage the brake system due to mispositioning, incorrect assembly or failure include the exhaust system, shock absorbers, springs, suspension control arms, stabilizer bar, power steering pump hoses, and transmission cooler pipes.

## 20. Hub, Bearing and Retainer (Fig. 3-33)

### a. Removal

1. Remove wheel disc.
2. Loosen wheel mounting nuts.
3. Remove drive axle cotter pin.
4. Loosen hub to drive axle nut.
5. Raise car and place jack stands under lower control arms.
6. Remove hub nut, washer and wheel mounting nuts, and remove wheel and tire.
7. Remove caliper as described in Section 5, Note 30a.
8. Mark hub and disc for alignment on assembly and remove disc.
9. Remove upper spherical joint cotter pin and loosen nut.
10. Using a hammer and drift, strike steering knuckle in area of upper spherical joint until upper spherical joint is loose.

**CAUTION:** Use extreme care to prevent hammer from slipping and hitting brake hose.

11. Remove tie rod end cotter pin and nut.
12. Using Tie Rod End Puller, J-21930, disconnect tie rod end at steering knuckle.

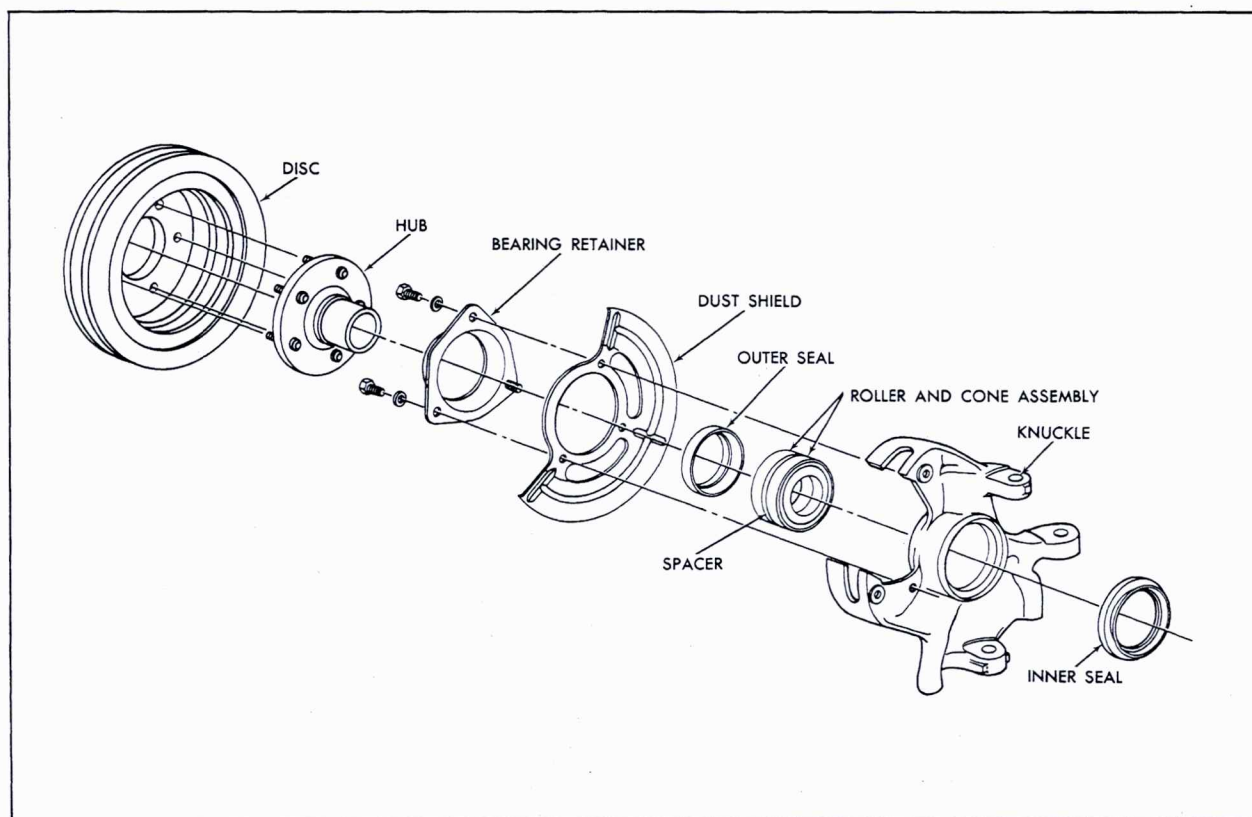


Fig. 3-33 Front Hub, Bearing and Retainer



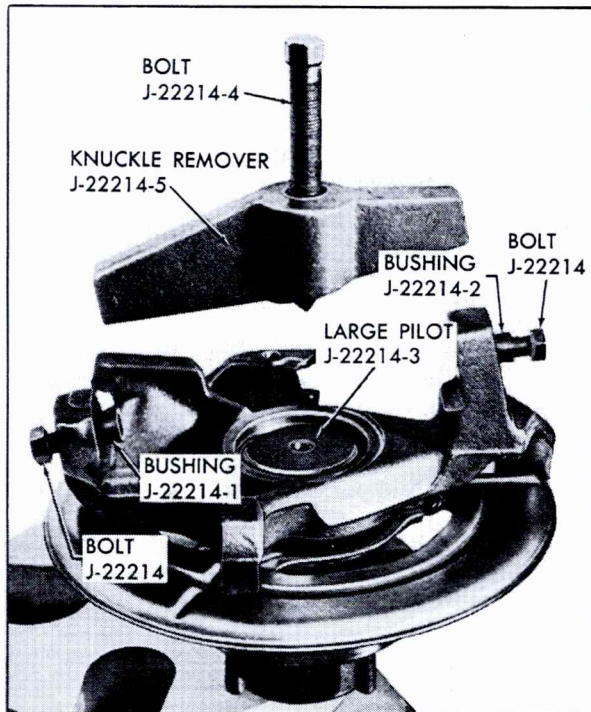


Fig. 3-34 Hub and Bearing Removal Tools (Assembly)

13. Remove lower spherical joint cotter pin and nut.
14. Using Ball Joint Puller, J-22292, and Adapter, J-22292-3, disconnect lower spherical joint.
15. Install a short length of rubber hose over the lower control arm torsion bar connector.
16. Remove upper spherical joint nut and remove brake line clip from stud.
17. Remove upper spherical joint stud from steering knuckle.
18. Remove hub and knuckle as an assembly.

#### b. Disassembly (Figs. 3-34, 3-37)

1. Remove three bolts securing splash shield and bearing retainer to steering knuckle and remove splash shield.
2. Remove steering knuckle inner seal, Fig. 3-36, and discard seal.

**CAUTION:** Use extreme care when removing seal to prevent damage to the seal mating surface on the steering knuckle.

3. Install Small Bushing, J-22214-1, in upper end of steering knuckle.
4. Install Large Bushing, J-22214-2, in lower end of steering knuckle.
5. Install Large Pilot, J-22214-3, on inner end of hub, Fig. 3-34.
6. Install Knuckle Remover, J-22214-5, between upper and lower ends of steering knuckle, Fig. 3-34.
7. Secure Knuckle Remover to steering knuckle by installing two small bolts, J-22214, through bushings previously installed.
8. Secure Knuckle Remover, J-22214-5, in a

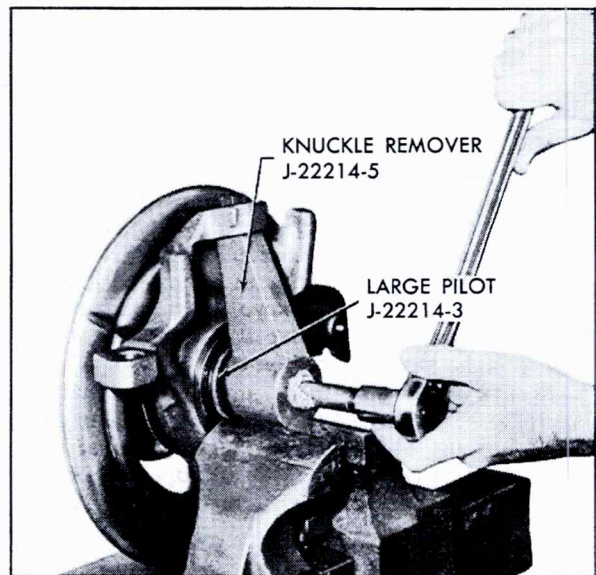


Fig. 3-35 Removing Hub and Bearings From Knuckle

vise, with knuckle assembly attached, Fig. 3-35.

9. Coat Large Bolt, J-22214-4, with chassis lubricant and install bolt in Knuckle Remover, J-22214-5.

10. Tighten Large Bolt, J-22214-4, until hub, bearing retainer, steering knuckle outer seal and bearing assembly are pressed out of steering knuckle.

11. Install bearing removal tools as shown in Fig. 3-37.

12. Install legs (J-23345), of bearing removal tool between outer seal and inner race of bearing.

**CAUTION:** Bearing puller legs must be pushed down firmly until they contact the edge of the inner race of the bearing. If legs are not pushed down far enough they will pull against the roller cage and damage the bearing during removal. Both legs may be snapped in place on

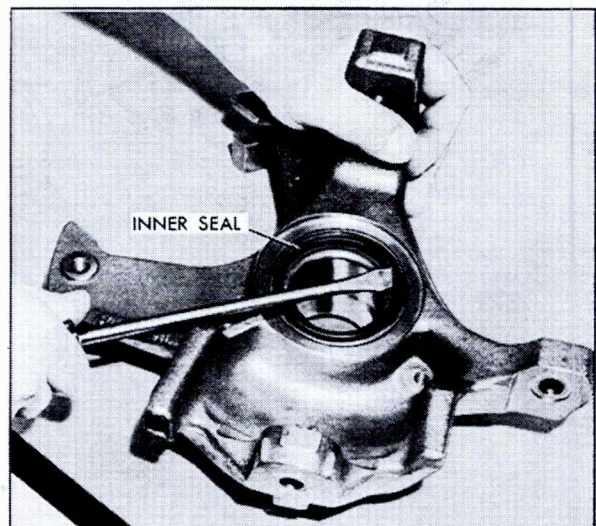


Fig. 3-36 Removing Steering Knuckle Inner Seal



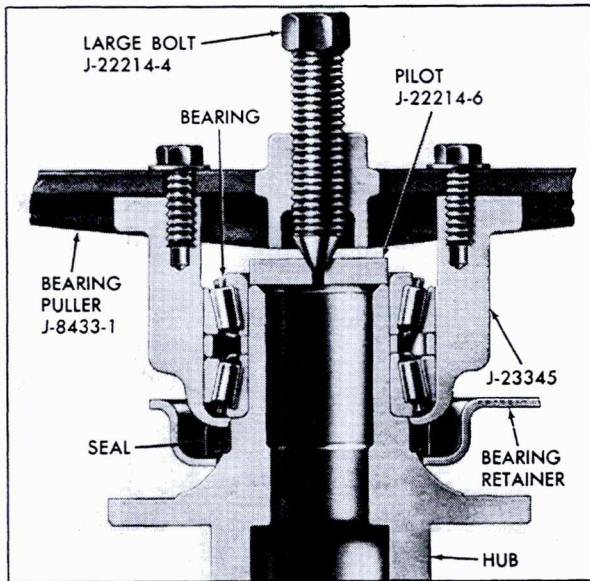


Fig. 3-37 Removing Bearings From Hub

one side of the bearing and then slid around until they are positioned on opposite sides.

13. Position Small Pilot, J-22214-6, on inner end of hub.

14. Position Bearing Remover, J-8433-1, on legs, J-23345, Fig. 3-37.

NOTE: Center bearing remover on legs.

15. Coat Large Bolt, J-22214-1, with chassis lubricant and install bolt in Bearing Remover, J-8433-1.

16. Tighten Large Bolt, J-22214-4, tight enough to hold tool assembly in the proper position.

17. Install a large clamp on legs of Bearing Remover, J-8433-1, Fig. 3-37.

18. Secure Bearing Remover, J-8433-1, in a vise, with knuckle assembly attached.

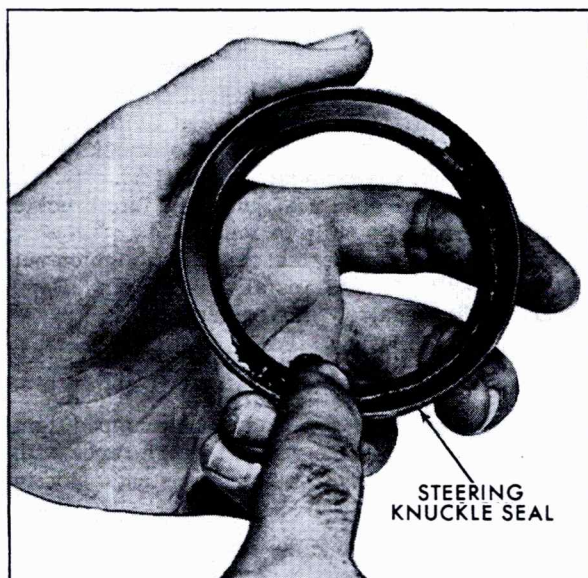


Fig. 3-38 Lubricating Steering Knuckle Seal

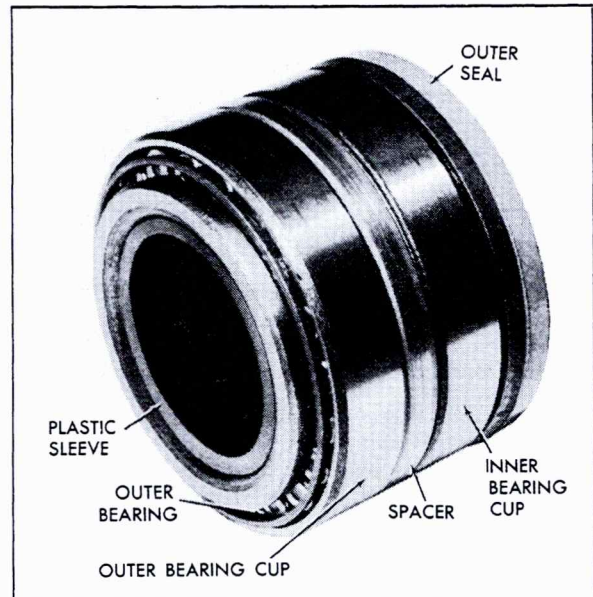


Fig. 3-39 Bearing Package

19. Tighten Large Bolt, J-22214-4, until hub is pressed out of bearing assembly.

20. Remove steering knuckle outer seal and bearing retainer from hub and discard outer seal.

### c. Assembly

NOTE: The front wheel bearings are supplied as matched assemblies and must be serviced as complete assemblies.

Inspect the steering knuckle bore and the steering knuckle seal contact surface on the drive axle. Remove any rust present using #400 grit "wet" paper and kerosene. When sanding, use a

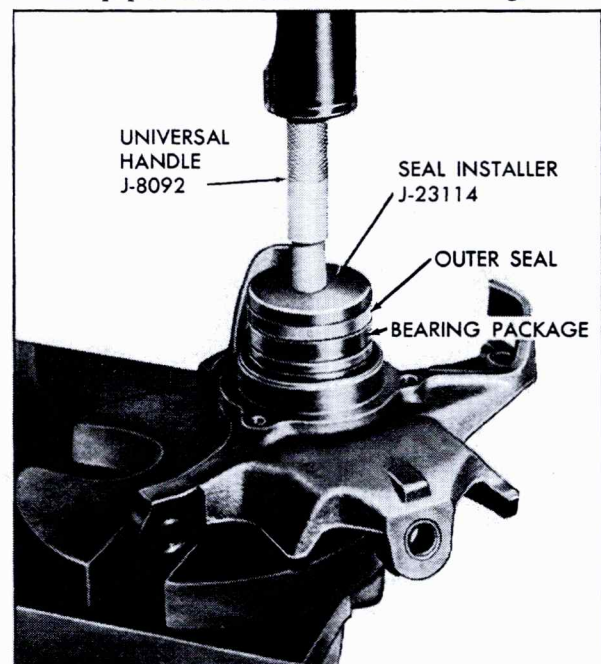


Fig. 3-40 Installing Bearing Package



circular motion only to avoid spiral marks on sealing surface.

1. Position steering knuckle on arbor press with outboard face of knuckle facing up.

2. Using special lubricant provided in bearing package, apply lubricant to hub shaft and both steering knuckle seals, Fig. 3-38.

NOTE: One tube of lubricant will service one complete hub and knuckle assembly.

3. Install outer steering knuckle seal on Seal Installer, J-23114.

4. Position seal and seal installer on bearing kit and position kit in steering knuckle bore.

CAUTION: Do not remove plastic sleeve in bearing kit at this time, as sleeve is used for a retainer to prevent bearings from being mispositioned in cups, or damaged during installation, Fig. 3-39.

5. Press bearing kit and outer seal into steering knuckle, Fig. 3-40.

NOTE: Bearing kit and outer seal is installed when inner bearing cup bottoms out on shoulder in steering knuckle bore.

6. Position splash shield on outer face of steering knuckle.

7. Position bearing retainer over splash shield and secure bearing retainer and splash shield to steering knuckle with three bolts. Tighten bolts to 35 foot-pounds. Remove knuckle assembly from press.

8. Remove plastic sleeve from bearing kit previously installed in steering knuckle.

9. Working from inner face of steering knuckle, use remainder of special lubricant to coat inner

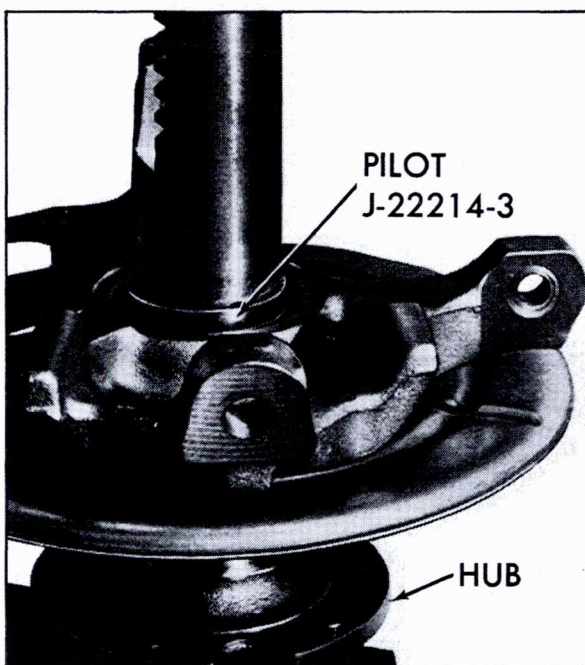


Fig. 3-41 Installing Hub In Knuckle

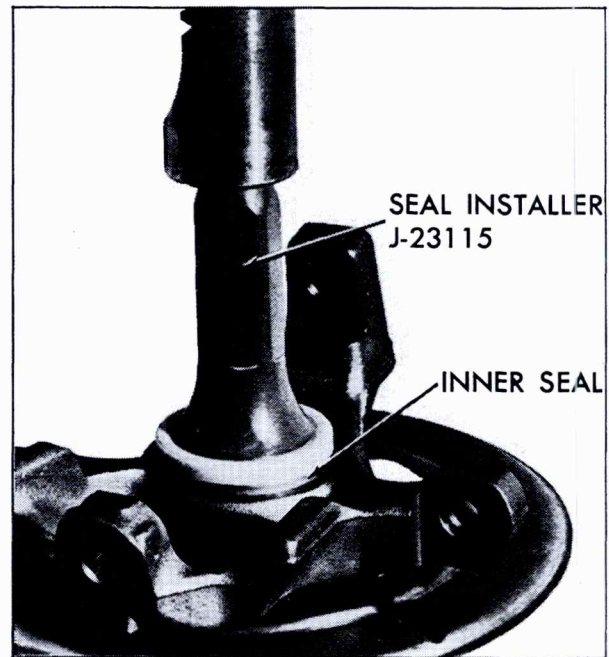


Fig. 3-42 Installing Inner Seal In Knuckle

race of bearings before installing hub in knuckle and bearing assembly.

10. Position hub on arbor press with stud end down.

CAUTION: Support hub so that hub is not supported by the wheel mounting studs.

11. Position knuckle and bearing assembly on hub.

12. Install Large Pilot, J-22214-3, through steering knuckle so that pilot seats on bearing, Fig. 3-41, and press knuckle assembly on hub.

13. Install inner seal on Seal Installer, J-23115, and press inner seal into steering knuckle, Fig. 3-42.

#### d. Installation

1. Guide knuckle assembly over drive axle, install lower spherical joint stud into knuckle, and attach nut. Do not tighten nut at this time.

2. Install tie-rod end stud into knuckle and attach nut. Do not tighten nut at this time.

3. Install upper spherical joint stud into knuckle and install brake line clip on stud.

4. Install upper spherical joint nut, tighten nut to 40 foot-pounds and install cotter pin. Bend cotter pin tight against flats on nut.

NOTE: If cotter pin cannot be installed, tighten nut to next hole and install cotter pin.

CAUTION: Cotter pin must be crimped tight against flats on nut to prevent interference with or damage to the drive-axle constant velocity joint or seal.

5. Tighten tie-rod end nut to 30 foot-pounds and install cotter pin.

6. Tighten nut on lower spherical joint stud to 40 foot-pounds and install cotter pin.



7. Remove rubber hose from lower control arm torsion bar connector.

8. Install drive axle washer and nut. Do not tighten nut at this time.

9. Using alignment marks placed on hub and disc at time of disassembly, align disc with hub and install disc on hub.

10. Install one or two nuts on hub to prevent disc from falling or being knocked off hub.

11. Install caliper as described in Section 5, Note 30b.

12. Remove nuts used to hold disc on hub, and install wheel and tire.

13. Install wheel mounting nuts, turn up snug, but do not tighten nuts at this time.

14. Raise car, remove jack stands and lower car.

15. Tighten wheel mounting nuts to 105 foot-pounds.

16. Tighten drive axle to hub nut to 105 foot-pounds and install cotter pin.

17. Install wheel disc.

18. Adjust brakes as described in Section 5.

19. Check standing height and front end alignment and adjust as required.

## 21. Steering Knuckle and Inner Seal

### a. Removal

1. Remove wheel disc.

2. Remove drive axle cotter pin and loosen nut.

3. Loosen wheel mounting nuts.

4. Raise car and place jack stands under lower control arms.

5. Remove drive axle to hub nut and washer and wheel mounting nuts.

6. Remove wheel and tire.

7. Remove upper spherical joint cotter pin and nut.

8. Remove brake line hose clip from upper spherical joint stud.

NOTE: Do not loosen spherical joint stud.

9. Install one or two wheel mounting nuts to prevent disc from falling off hub while removing caliper.

10. Remove caliper as described in Section 5, Note 30b.

11. Remove nuts used to retain disc and remove disc from hub.

12. Place a short length of rubber hose over the lower control arm torsion bar connector, Fig. 3-43.

13. Using a brass drift, and hammer, strike steering knuckle in area of upper spherical joint and loosen upper spherical joint stud.

CAUTION: Use extreme care to prevent hammer from slipping and hitting brake hose.

14. Remove cotter pin and nut from tie-rod end.

15. Remove tie-rod end from steering knuckle using Tie Rod End Puller, J-21930.

16. Remove cotter pin and nut from lower spherical joint stud.

17. Using Ball Joint Puller, J-22292, and Adapter, J-22292-3, disconnect lower spherical joint at steering knuckle.

NOTE: Use extreme care when installing Adapter, J-22292-3, between spherical joint seal and steering knuckle.

18. Guide hub and knuckle assembly over end of drive axle and remove from car.

NOTE: If knuckle is being replaced, remove hub, bearings, cups and seals as described in Note 20.

19. To remove steering knuckle inner seal, use a screwdriver, Fig. 3-36.

### b. Cleaning and Inspection

Inspect seal surface in the steering knuckle bore and the seal contact surface on the drive axle. Remove any rust present, using #400 grit "wet" paper and kerosene. When sanding, use a circular motion only, to avoid spiral marks on sealing surfaces.

### c. Installation

If inner seal is being replaced, proceed with steps 1 through 3. If knuckle is being replaced, install hub, bearings, bearing cups and seals as described in Note 20, then proceed with steps 4 through 22.

1. Install seal on Seal Installer, J-23115.

2. Position knuckle and hub assembly on arbor press, Fig. 3-42.

NOTE: Support hub and knuckle assembly so that assembly is not supported by the wheel mounting studs.

3. Position seal and Seal Installer, J-23115, on

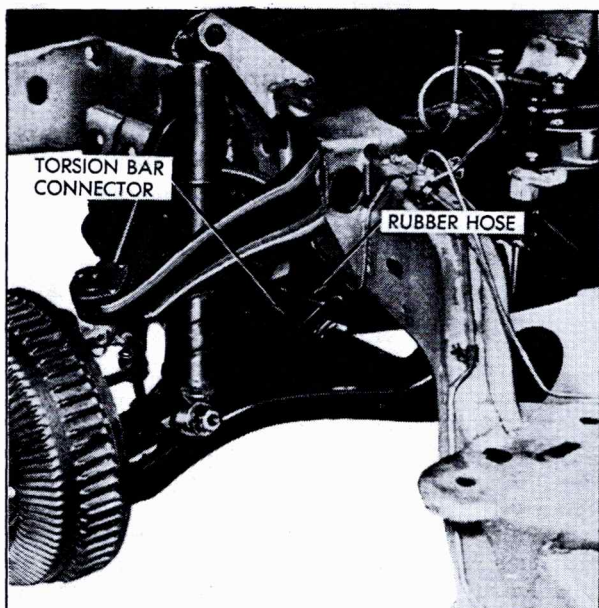


Fig. 3-43 Rubber Hose Location



knuckle and press seal into knuckle, Fig. 3-42.

4. Apply a generous amount of high melting point, Sodium or Lithium base grease to steering knuckle inner seal.

5. Align splines in hub with splines on drive axle and install hub and knuckle assembly on drive axle.

6. Install lower spherical joint stud into steering knuckle and attach nut. Do not tighten nut at this time.

7. Install tie-rod end stud into knuckle and attach nut. Do not tighten nut at this time.

8. Install upper spherical joint stud into knuckle and install brake line clip on stud.

9. Install upper spherical joint nut, tighten nut to 40 foot-pounds and install cotter pin. Bend cotter pin tight against flats on nut.

NOTE: If cotter pin cannot be installed, tighten nut to next hole and install cotter pin.

CAUTION: Cotter pin must be crimped tight against flat on nut to prevent interference with or damage to the drive-axle constant velocity joint or seal.

10. Tighten tie-rod end nut to 30 foot-pounds and install cotter pin.

11. Tighten nut on lower spherical joint stud to 40 foot-pounds and install cotter pin.

12. Remove rubber hose from lower control arm torsion bar connector.

13. Install drive axle washer and nut. Do not tighten nut at this time.

14. Install caliper as described in Section 5, Note—.

15. Install wheel and tire.

16. Install wheel mounting nuts, turn up snug, but do not tighten nuts at this time.

17. Raise car, remove jack stands and lower car.

18. Tighten wheel mounting nuts to 105 foot-pounds.

19. Tighten drive axle to hub nut to 105 foot-pounds and install cotter pin.

20. Install wheel disc.

21. Adjust brakes as described in Section 5.

22. Check standing height and front end alignment and adjust as required.

## 22. Torsion Bar

### a. Removal

1. Raise rear of car and place jack stands under rear axle.

2. Raise front of car until front wheels are approximately one foot off the ground.

3. Place jack stands under front lower control arms.

4. Remove adjusting bolt from both torsion bar lock nuts.

5. Install Torsion Bar Remover and Installer, J-22517, on Torsion Bar Cross Member. Fig. 3-44.

NOTE: Install Torsion Bar Remover "U"

Bolt on cross member. Next, install Torsion Bar Remover Base on "U" Bolt and install two lock nuts on "U" Bolt. Make certain Base is installed flush with last thread on "U" Bolt and install center bolt on Torsion Bar Remover and Installer.

6. Tighten center bolt on Torsion Bar Remover and Installer, J-22517, until torsion bar adjusting arm is raised high enough to permit removal of lock nut. Then remove lock nut.

7. Repeat steps 5 and 6 on other end of cross member, and then remove tool from cross member.

8. Remove parking brake cable clip at torsion bar cross member.

9. Remove torsion bar cross member bolts, rubber bushings and retainers on both ends of cross member.

10. Drive on cross member until both torsion bars bottom out in lower control arm torsion bar connectors.

11. Slide, or drive, cross member toward rear of car until both torsion bars are free from cross member.

CAUTION: When torsion bars are freed from cross member, both adjusting arms will fall out of cross member.

12. Raise front of car and lower jack stands so that when car is lowered, front wheels will be approximately six inches off the ground. Lower car on jack stands.

13. Lift up on cross member, slide torsion bars out of lower control arm connectors and remove torsion bars from car.

### b. Installation

1. Check torsion bar for deep nicks, scratches, dents or splits along the seam. If these conditions exist, torsion bars must be replaced.

2. Lubricate both ends of torsion bar for approximately 3 inches.

NOTE: The torsion bars are stamped with the letter "L" for left and "R" for right. The stamped end is installed in the lower control arm torsion bar connector.

3. Slide torsion bar all the way into lower control arm connector.

4. Repeat steps 1 through 4 for other torsion bar.

5. Place torsion bar adjusting arm in cross member and hold in place. With other hand, slide torsion bar toward rear of car until torsion bar is fully seated in adjusting arm.

6. Repeat step 5 for other torsion bar.

7. Install rubber bushings and retainers between torsion bar cross member and frame on both sides.

8. Raise front of car until front wheels are approximately one foot off the ground.

9. Raise jack stands and position under lower control arm.

10. Install cross member mounting bolts and tighten to 40 foot-pounds.



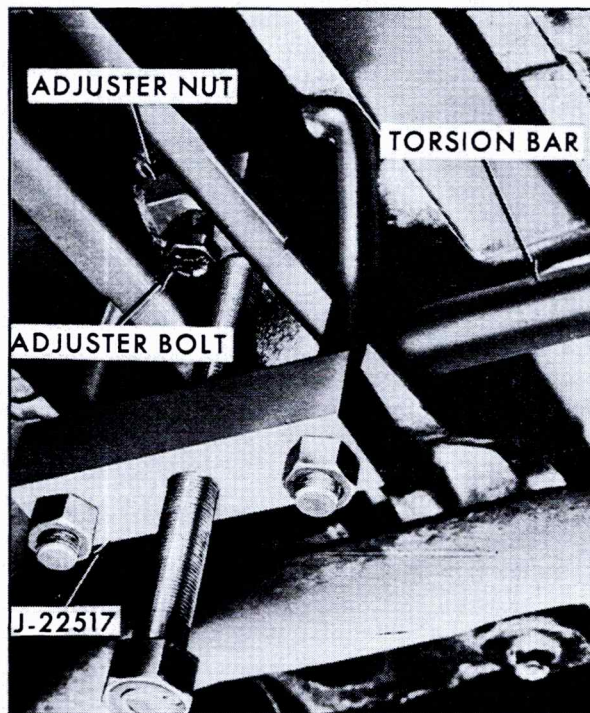


Fig. 3-44 Removing and Installing Torsion Bar

11. Install Torsion Bar Remover and Installer, J-22517, on cross member, Fig. 3-44.

NOTE: When installing Torsion Bar Remover and Installer, J-22517, follow steps 5 and 6 of part (a) of this procedure.

12. Tighten center bolt on Torsion Bar Remover and Installer, J-22517, until torsion bar adjusting arm is raised high enough to permit installation of lock nut. Install lock nut.

13. Remove Torsion Bar Remover and Installer, J-22517, and install on other end of cross member.

14. Repeat steps 11 and 12 for other torsion bar.

15. Remove Torsion Bar Remover and Installer, J-22517.

16. Using new torsion bar adjusting bolts, lubricate threads on bolts and install bolts into lock nuts on both sides of car.

17. Raise car, remove jack stands and lower car.

18. Check standing height and adjust as required.

19. Check front wheel alignment and adjust if necessary.

## 23. Upper Control Arm

### a. Removal

NOTE: The upper control arm can be serviced either as an assembly, or by its component parts. If it is not necessary to replace the control arm as an assembly, there are two service packages available. One pack-

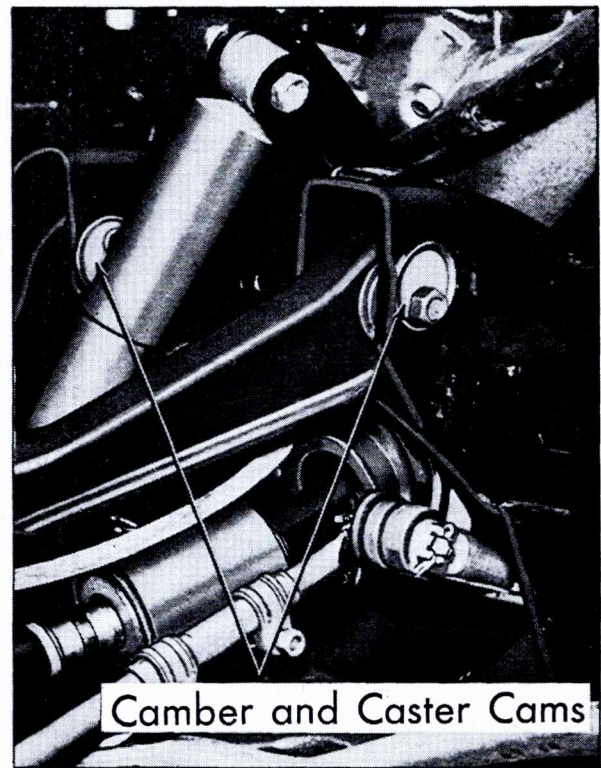


Fig. 3-45 Caster, Camber, Cam Locations

age contains bushings only, the other package consists of a spherical joint, two bolts, one nut and a cotter pin.

1. Remove wheel disc.
2. Loosen wheel mounting nuts.
3. Raise car and place on jack stands.
4. Remove wheel mounting nuts and remove wheel and tire.
5. Disconnect shock absorber at upper mount.
6. Remove cotter pin and nut on upper spherical joint.
7. Remove brake hose clip from spherical joint stud.
8. Remove brake hose to prevent damage to hose when removing spherical joint stud from steering knuckle.
9. Using a hammer and drift, disengage spherical joint stud and remove from steering knuckle.
10. Remove upper control arm cam assemblies and remove control arm and shims from car.

### b. Installation

1. Guide upper control arm over shock absorber and install bushing ends and shims into frame mounts.
2. Install cam assemblies as shown in Fig. 3-45.

NOTE: The front cam is mounted up. The rear cam is mounted down.

3. Install shock absorber in upper mount. Tighten nut to 75 foot-pounds.
4. Install upper spherical joint into steering knuckle.



5. Install brake hose and bleed brakes.
6. Install brake line clip, nut and cotter pin on upper spherical joint stud. Tighten nut to 40 foot-pounds.

NOTE: Use extreme care when performing step 6 to prevent damage to brake line.

CAUTION: Cotter pin must be crimped toward upper control arm to prevent damage to the outer constant velocity joint seal.

7. Install wheel and tire. Tighten nuts to 105 foot-pounds.
8. Raise car. Remove jack stands and lower car.
9. Check standing height as described in Note 34 and adjust.
10. Check caster, camber, and toe-in as described in Note 33 and adjust.

## 24. Upper Control Arm Bushing (On Car)

### a. Removal

NOTE: The upper control arm bushings can be removed and installed on or off the car.

1. Remove wheel disc.
2. Loosen wheel mounting nuts.
3. Raise car and remove wheel and tire.
4. Disconnect shock absorber at upper mount and remove nut and bolt.
5. Remove upper control arm cam assemblies and nuts.
6. Remove upper control arm from frame mounts.
7. Attach bushing removal tools as shown in Fig. 3-46.
8. Remove bushings and removal tools.

### b. Installation

1. Place bushings in control arm.
2. Install tools as shown in Fig. 3-47 and press bushings into control arm.
3. Remove bushing removal and installation tools.
4. Guide upper control arm over shock ab-

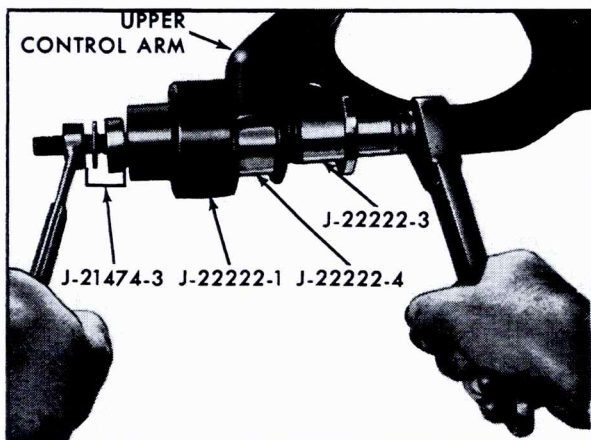


Fig. 3-46 Removing Upper Control Arm Bushings

sorber and install bushing ends into frame mounts.

5. Install cam assemblies as shown in Fig. 3-45.

NOTE: The front cam is mounted up. The rear cam is mounted down.

6. Install shock absorber in upper mount. Tighten nut to 75 foot-pounds.
7. Install wheel and tire.
8. Lower car and tighten wheel nuts to 105 foot-pounds.
9. Install wheel disc.
10. Check standing height as described in Note 34 and adjust if necessary.
11. Adjust toe-in, caster and camber as described in Note 33.

## 25. Upper Control Arm Spherical Joint

### a. Removal

1. Remove upper control arm as described in Note 23a.
2. Place upper control arm on workbench and grind the head off three rivets.
3. Using a hammer and punch, drive on center of rivets until ball joint can be removed from control arm.

### b. Installation

1. Install new ball joint in upper control arm.
2. Install three bolts in top side of control arm.
3. Install three nuts from under side of control arm. Tighten nuts to 9 foot-pounds.
4. Install upper control arm as described in Note 23b.
5. Lubricate the spherical joint fitting until grease escapes between seal and steering knuckle, Fig. 3-48.

## 26. Lower Control Arm

NOTE: The lower control arm components

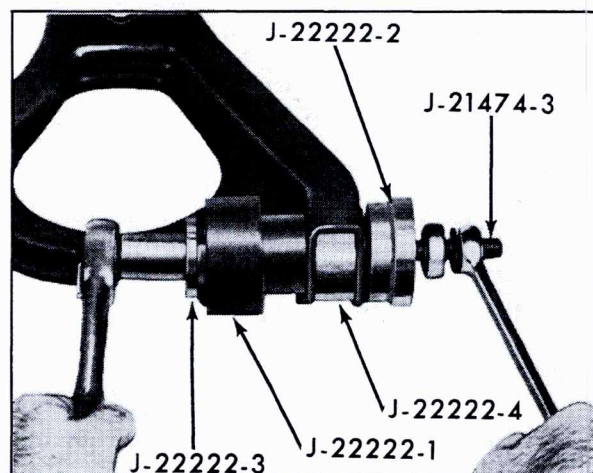


Fig. 3-47 Installing Upper Control Arm Bushings

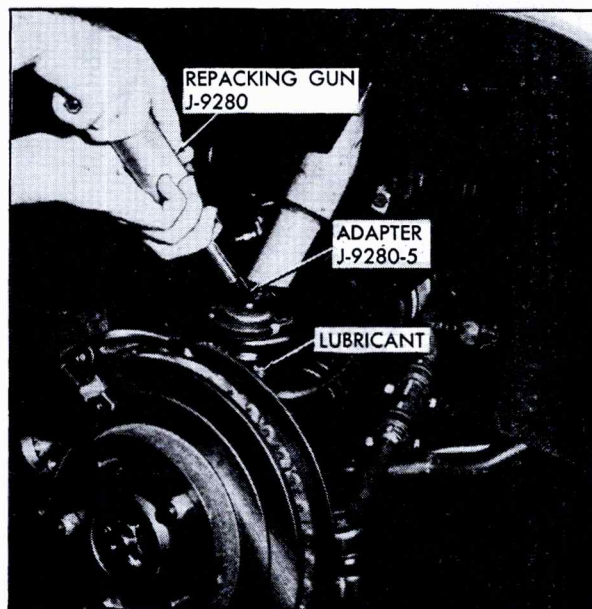


Fig. 3-48 Repacking Upper Spherical Joint (693)

are serviced as individual parts and are available at your Servicing Parts Warehouse.

#### a. Removal

1. Remove wheel disc.
2. Loosen wheel mounting nuts.
3. Remove hub cotter pin and loosen nut.
4. Raise car.
5. Remove wheel and tire.
6. Remove torsion bar as described in Note 22a.
7. Remove hub nut and washer.
8. Remove brake line clip attached to frame.
9. Remove cotter pin, nut and brake line clip from upper spherical joint stud.
10. Using a hammer and drift, drive on knuckle in area of upper spherical joint and remove joint from steering knuckle.

**CAUTION:** Use extreme care to prevent hammer from slipping and hitting brake hose.

11. Disconnect shock absorber at lower mount. Then work shock off mount.
12. Using Tie Rod End Puller, J-21930, disconnect tie rod end at steering knuckle.
13. Disconnect stabilizer bar and disconnect nut and link bolt.
14. Using Ball Joint Puller, J-22292, and Adapter, J-22292-3, disconnect lower spherical joint.
15. Disengage hub, knuckle and disc as an assembly from drive axle and secure assembly to the upper control arm with a piece of wire.
16. Remove lower control arm to frame attaching nuts and bolts.
17. Disengage lower control arm from frame mounts.
18. Remove steering knuckle to drive axle seal.

#### b. Installation

1. Apply a generous amount of high melting point Sodium or Lithium base lubricant to the inner portion of a new steering knuckle seal, Fig. 3-38.

**NOTE:** Inspect the seal contact surface in the steering knuckle and on the drive axle. Remove any rust present using #400 grit "wet" paper and kerosene. When sanding, use a circular motion only, to avoid spiral marks on seating surface.

2. Using Seal Installer, J-22234, install seal in steering knuckle.
3. Remove wire and install hub, disc and knuckle assembly on drive axle.
4. Install lower control arm into mounts in chassis. Do not tighten nuts at this time.
5. Install lower control arm spherical joint into steering knuckle. Tighten nut to 40 foot-pounds and install cotter pin.
6. Tighten lower control arm inner mount bolts to 75 foot-pounds.
7. Lift up upper control arm and install shock absorber on lower control arm mount. Tighten nut to 75 foot-pounds.
8. Install upper control arm spherical joint into steering knuckle.
9. Install brake line clip on upper spherical joint stud. Tighten nut to 40 foot-pounds and install cotter pin.

**NOTE:** Cotter pin must be crimped tight against flats on nut to prevent cotter pin from interfering with outer constant velocity joint seal.

10. Install brake line clip to chassis.
11. Install tie rod end in steering knuckle. Tighten nut to 30 foot-pounds.
12. Install stabilizer bar as described in Note 31b.
13. Install Hub to drive axle washer and nut.
14. Install torsion bar as described in Note 22b.

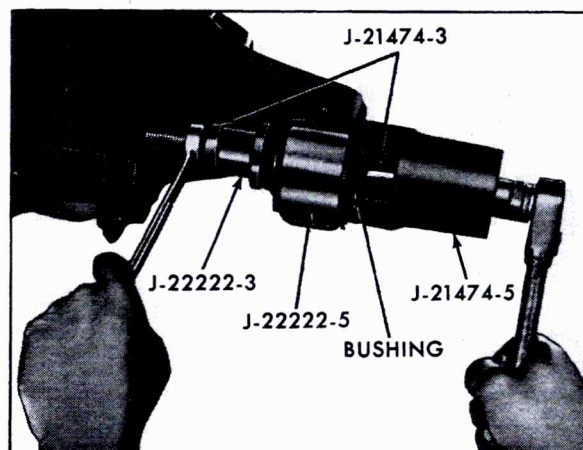


Fig. 3-49 Removing Lower Control Arm Bushings



15. Install wheel and tire.
16. Lower car.
17. Tighten hub to drive axle nut to 105 foot-pounds, and install cotter pin.

NOTE: If cotter pin cannot be installed, tighten nut to next hole location and install cotter pin.

18. Tighten wheel nuts to 105 foot-pounds.
19. Install wheel disc.
20. Adjust standing height as described in Note 34.

## 27. Lower Control Arm Bushings

### a. Removal

1. Remove lower control arm as described in Note 26a.
2. Install tools as shown in Fig. 3-49 and press bushings out of control arm.

### b. Installation

1. Install tools as shown in Fig. 3-50, and press bushings into lower control arm.
2. Install lower control arm as described in Note 26b.
3. Check standing height and adjust if necessary.

## 28. Lower Control Arm Spherical Joint

### a. Removal

1. Remove lower control arm as described in Note 26a.
2. Place lower control arm on its back on a work bench.
3. Using a chisel, cut two rivet heads off as shown in Fig. 3-51.
4. Place lower control arm right side up and grind large rivet head off as shown in Fig. 3-52.
5. Using a hammer and punch, drive on center rivet of joint until joint is out of control arm.

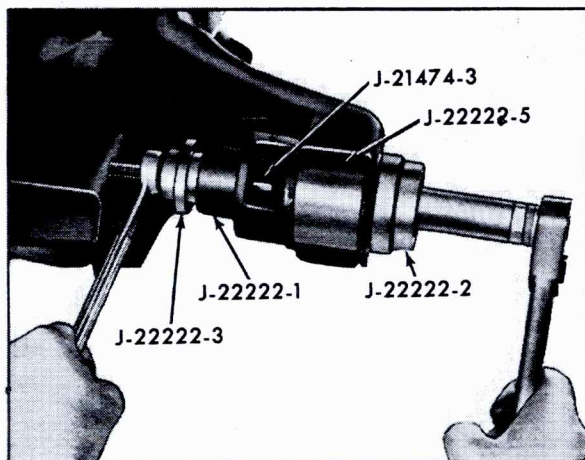


Fig. 3-50 Installing Upper Control Arm Bushings

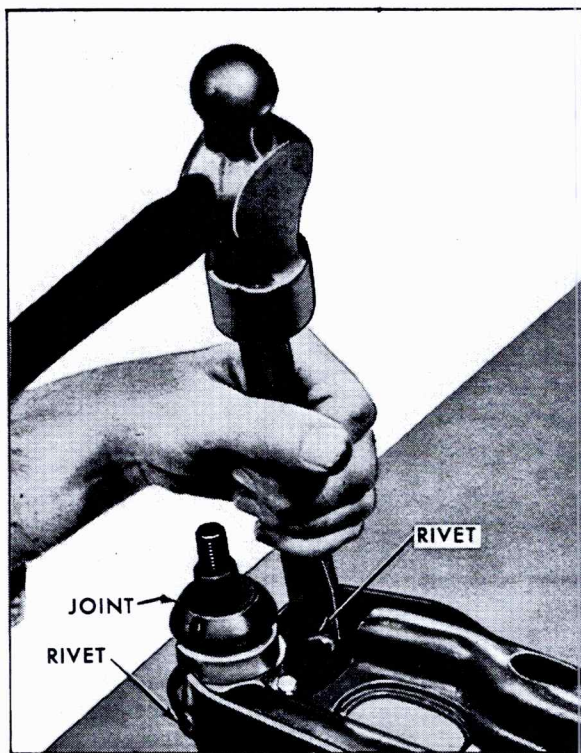


Fig. 3-51 Removing Lower Spherical Joint Rivets

### b. Installation

1. Install service spherical joint into control arm and tighten bolts and nut as shown in Fig. 3-53.
2. Install lower control arm as described in Note 26b.

## 29. Lower Control Arm Spherical Joint Seal

The lower spherical joint seal can be installed

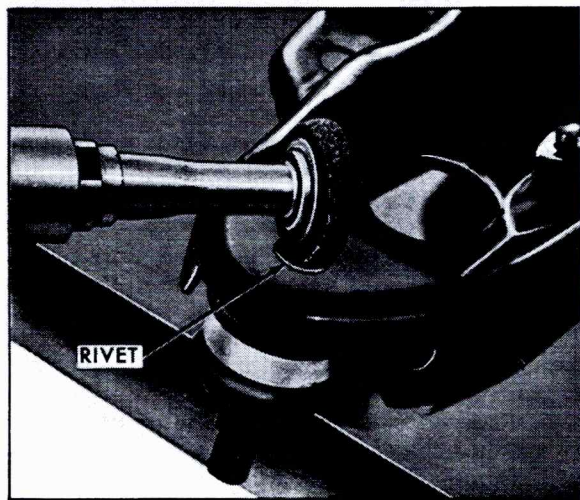


Fig. 3-52 Removing Lower Spherical Joint Center Rivet



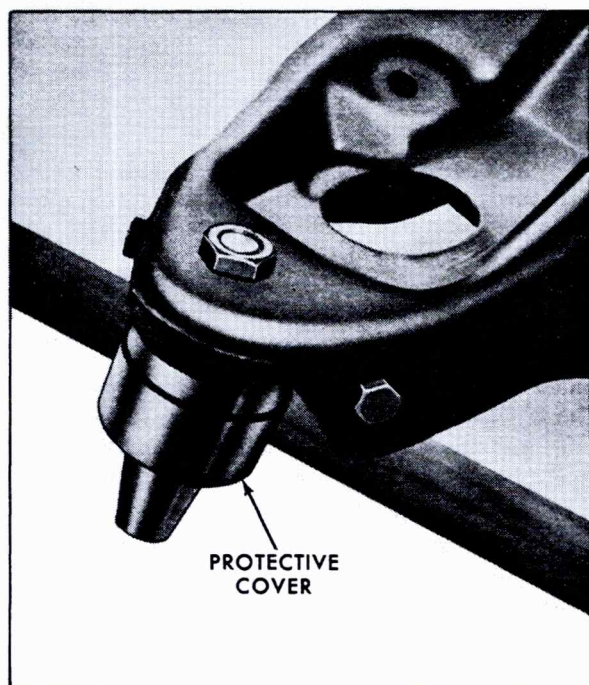


Fig. 3-53 Lower Spherical Joint Installed

with the lower control arm either on or off the car.

#### a. Removal (On Car)

1. Remove steering knuckle as described in Note 21a.
2. Using a hammer, tap lightly on seal retainer.
3. Use a small screw driver and work retainer off of joint. Discard seal and retainer.
4. Wipe grease from spherical joint and stud.

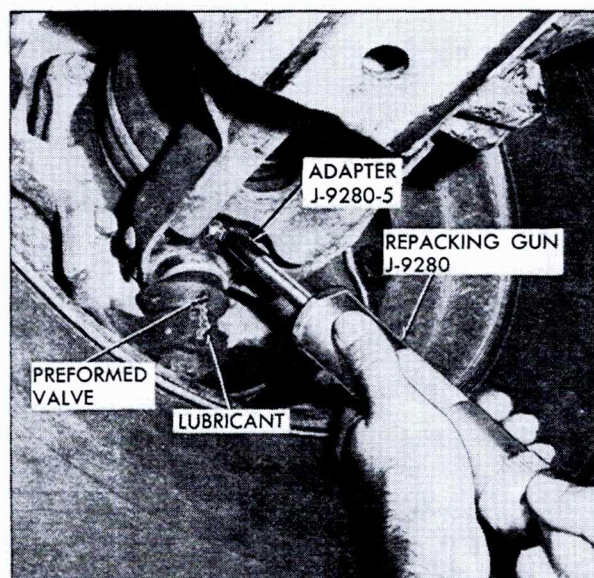


Fig. 3-54 Repacking Lower Spherical Joint Seal

#### b. Installation

1. Position new seal over spherical joint stud.
2. Lubricate jaws of Camber Adjusting Wrench, J-9231, and slide jaw between seal and retainer.
3. Tap lightly with hammer on end of Camber Adjusting Wrench, J-9231, until seal retainer is fully seated.
4. Install steering knuckle as described in Note 21b.
5. Lubricate spherical joint fitting until grease escapes from valve in side of seal as shown in Fig. 3-54.

### 30. Spherical Joint Checks

#### a. Vertical Checks

1. Raise car and position jack stands under lower control arms as near as possible to each spherical joint. Car must be stable and should not rock on floor stands.
2. Clamp vice grips on end of drive axle and position dial indicator so that dial indicator ball rests on vice grip.
3. Place a pry bar between lower control arm and outer race and pry down on bar. Care must be used so that drive axle is not damaged. Reading must not exceed .125".

#### b. Horizontal Check

1. Raise car and position jack stands under lower control arms as near as possible to each spherical joint.
2. Position dial indicator so that button on indicator rests against outer bead seat on wheel.
3. Grasp front wheel and push in on bottom of tire while pulling out at top. Read gage, then reverse the push-pull procedure. Horizontal deflection on gage should not exceed .125" at wheel rim. This procedure checks both the upper and lower spherical joints.

### 31. Stabilizer Bar

#### a. Removal

1. Place car on jack stands.
2. Remove link bolts, nuts, grommets, spacers and retainers from lower control arm. Discard bolts and nuts.
3. Remove bracket to chassis attaching bolts and remove stabilizer bar from car.

#### b. Installation

1. Position stabilizer bar in place on car.
2. Assemble grommets, spacers, and retainers on new link bolt as shown in Fig. 3-55.
3. Position link bolt on lower control arm, and install remaining grommet, retainer and nut.
4. Install stabilizer to chassis brackets.

NOTE: New link bolts are tightened to 14 foot-pounds, then cut off 1/4" from nut.



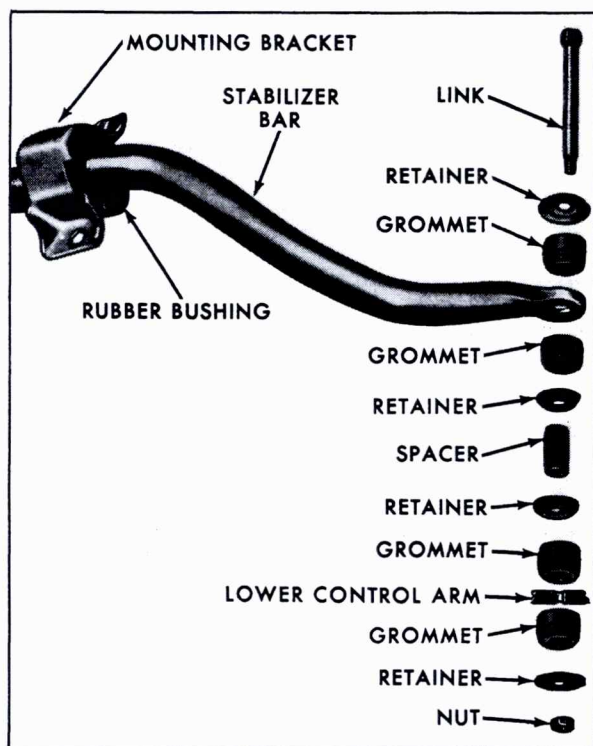


Fig. 3-55 Front Stabilizer Linkage

## 32. Front Shock Absorber

### a. Removal

1. Remove wheel disc.
2. Loosen wheel mounting nuts.
3. Raise car and place on jack stands.
4. Remove wheel and tire.
5. Place a hydraulic jack under lower control arm near outer end.
6. Raise lower control arm just enough to take load off of shock absorber.
7. Disconnect shock absorber at upper and lower mount.
8. Compress shock absorber and work lower mount free from mount bolt.
9. Guide shock absorber down and toward rear of car, and remove from car.

### b. Installation

1. Guide shock absorber up through upper control arm.
2. Position shock absorber on lower attaching bolt.
3. Extend upper shock absorber mount into frame attaching bracket.
4. Tighten shock absorber attaching nuts to 75 foot-pounds.
5. Install wheel and tire.
6. Remove hydraulic jack.
7. Remove jack stands and lower car.
8. Tighten wheel mounting nuts to 105 foot-pounds.
9. Install wheel disc.

## 33. Front Wheel Alignment

### a. Sequence of Operations

Front wheel alignment must be checked whenever the standing height is changed, or after the upper control arm has been removed and installed.

Front wheel alignment must be performed in the exact sequence as described in this procedure. Wheel alignment equipment manufacturers provide detailed instructions for checking wheel alignment with their alignment equipment. These instructions should be carefully followed.

In addition to the manufacturer's instructions, be sure to observe the following recommendations.

**NOTE:** Car must be on a level surface, gas tank full or a compensating weight added, front seat all the way to the rear, and front and rear tires inflated to the proper pressures. Refer to Tire Pressure Chart, Fig. 10-9, Section 10. Both doors must be closed and no passengers or additional weight should be in car or trunk.

1. Check standing height and adjust, if necessary. Refer to Note 34.
2. Raise car and check lateral run-out of both tires. Make a mark on the tire where maximum run-out occurs.
3. Rotate wheel so that the maximum run-out points either to the front or to the rear of car. (This neutralizes the effect of run-out on caster or camber). Lower car and recheck for proper alignment on alignment equipment.
4. Bounce front of car up and down several times to normalize the front standing height.
5. Check straight ahead position of steering wheel. Adjust if necessary.

### b. Camber and Caster (Fig. 3-56)

1. Check camber. The preferred range for camber is  $+3/8^\circ$  to  $-3/8^\circ$ . Do not reset unless camber exceeds the preferred range by  $3/8^\circ$ , or side to side settings vary beyond  $1^\circ$ . If necessary to adjust, proceed as follows:

- a. Loosen nuts on upper control arm front and rear cam bolts.
- b. Note camber reading and rotate front bolt to correct for  $1/2$  of incorrect reading or as near as possible.
- c. Rotate rear cam bolt to bring camber reading to  $0^\circ$ .
- d. Tighten front and rear bolts and check caster. Preferred caster range is  $-1\ 1/2^\circ$  to  $-2\ 1/2^\circ$ . Do not reset unless caster exceeds the preferred range by  $1/2^\circ$ , or side to side settings vary beyond  $1^\circ$ .

**NOTE:** If caster requires adjustment, proceed with step e; if not, move to step h.



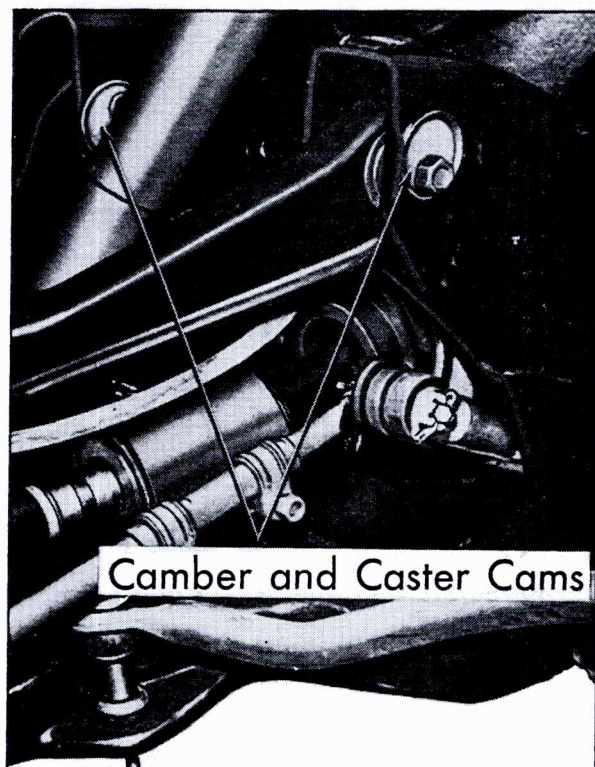


Fig. 3-56 Caster, Camber, Cam Locations

- e. Loosen front and rear cam bolt nuts.
- f. Using camber scale on alignment equipment, rotate front bolt so that the camber changes an amount equal to  $1/4$  of the desired caster change.

NOTE: If adjusting to correct for excessive negative caster, rotate front bolt to increase positive camber. If adjusting to correct for excessive positive caster, rotate front bolt to increase negative camber.

- g. Rotate the rear bolt until camber setting returns to its corrected position (step c).
- h. Tighten upper control arm cam nuts to 75 foot-pounds. Hold head of bolt securely; any movement of the cam will affect final setting and will require a recheck of the camber and caster adjustments.

#### c. Toe-in

Before checking toe-in, make certain that the distance from the center of the outer tie rod pivot, to the center of the inner tie rod pivot measures the same for both tie rods and that drag link height is correct. See Section 9, Note 5 for drag link height.

Preferred toe-in range is 0 inch to  $1/8$  inch. Do not reset unless toe-in exceeds the preferred range by  $1/8$  inch.

Toe-in is adjusted by turning the tie-rod adjuster tubes at the outer ends of each tie rod after loosening clamp bolts. The readings should be taken only when the front wheels are in a straight ahead position and with steering gear on its high spot.

1. Center steering wheel, raise car and check wheel run-out as described in Section 10, Note 4.
2. Loosen tie-rod adjuster nuts and adjust tie-rods to obtain  $1/16$  inch toe-in setting.
3. Tighten tie-rod adjuster nuts to 20 foot-pounds.
4. Position tie-rod adjuster clamps so that opening of clamps are facing up. Interference with front suspension components could occur while turning if clamps are facing down.

### 34. Standing Height Adjustment

The standing height must be checked, and adjusted if necessary, before performing the front end alignment procedure. The standing height is controlled by the adjustment setting of the torsion bar adjusting bolt. Clockwise rotation of the bolt increases the front height; counterclockwise decreases the front height.

Car must be on a level surface, gas tank full or a compensating weight added, front seat all the way to the rear, and front and rear tires inflated to the proper pressures. Refer to Tire Pressure Chart, Fig. 10-9. Both doors must be closed and no passengers or additional weight should be in car or trunk.

1. To obtain a front standing height reading, measure forward from the front edge of door 3 inches, Fig. 3-57.

- a. At this point, measure from the underside of the frame to the ground. This dimension should be  $6\frac{3}{8}$  inches.

2. To obtain a rear standing height reading, measure at the middle of the tab that fastens the spring bracket to the underside of the frame, Fig. 3-57.

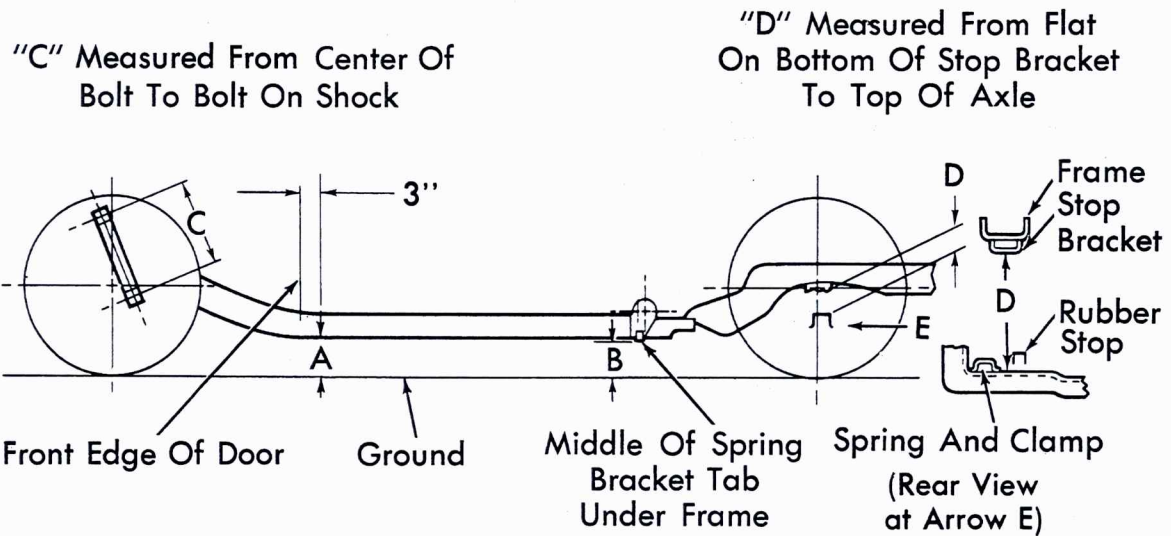
- a. At this point, measure from the underside of the frame to the ground. This dimension should be  $6\frac{3}{16}$  inches.

NOTE: Frame to ground dimensions must be within 1 inch from front to rear and within  $5/8$  inches from side to side.

If dimensions are not within tolerance, adjust torsion bar.



### 1969 Fleetwood Eldorado Standing Height Chart



Reference Locations Frame To Ground		Preferred Locations	
"A" Front	"B" Rear	"C" Front True Shock Length	"D" Rear Standing Height
6 $\frac{1}{4}$ " TO 6 $\frac{7}{16}$ "	5 $\frac{15}{16}$ " TO 6 $\frac{1}{2}$ "	14 $\frac{5}{8}$ " TO 14 $\frac{7}{8}$ "	4-23/32" To 5-15/32"

Fig. 3-57 Checking Standing Height

## GENERAL DESCRIPTION

Drive axles on the 1969 Fleetwood Eldorado (693 series), Fig. 3-58 are a complete flexible assembly, consisting of an axle shaft with a ball-type constant velocity joint at the outboard end and a tri-pot type constant velocity joint at the inboard end. The torsional damper on the right hand drive axle is not serviceable and must be replaced as a unit.

The inboard tri-pot joint is not only flexible to operate at various angles, but can also move in and out as required by the suspension while it travels through its ride motion.

Whenever any operations call for disconnecting, connecting, removal, or installation of the drive axles, extreme care must be exercised to prevent damage to the seals. When performing these operations, install a short length of rubber hose on the lower control arm torsion bar connector to prevent drive axle seals from being damaged.

**CAUTION:** When removing or installing the right hand drive axle, be sure to disconnect the negative battery cable. It is possible to short out the starter motor by making contact between the wrench and the starter motor terminals.

**CAUTION:** If any mispositioning, incorrect assembly, or failure of components in the area of the brake system pipes, hoses, or cylinders is observed, be sure to check for any brake damage that may have resulted from such a condition and correct as required. Components that could damage the brake system due to mispositioning, incorrect assembly or failure include the exhaust system, shock absorber, springs, suspension control arms, stabilizer bar, power steering pump hoses and transmission cooler pipes.

## SERVICE INFORMATION

### 35. Right Drive Axle

#### a. Removal

1. Disconnect negative battery cable.
2. Remove wheel disc.
3. Loosen wheel mounting nuts.
4. Remove drive axle spindle nut cotter pin and loosen spindle nut.
5. Raise car.
6. Remove wheel mounting nuts and remove wheel.
7. Remove drive axle spindle nut.
8. Using a block of wood and a hammer, tap on end of drive axle to unseat axle at hub assembly.

**NOTE:** Install a short piece of rubber hose on the lower control arm torsion bar connector as shown in Fig. 3-43, to prevent damage to the drive axle seals when removing or installing the drive axles.

9. Remove six drive axle to output shaft screws and lock washers.

**NOTE:** Have helper apply brakes to prevent drive axles from turning while removing screws.

10. Remove two output shaft support to engine bolts and one support to brace self-tapping screw.
11. Rotate inboard end of drive axle rearward toward starter motor.
12. Slide output shaft straight out toward side of car and remove output shaft from under side of car.

**CAUTION:** Use extreme care to protect final drive oil seal surface on output shaft from nicks and scratches.

13. Remove drive axle by rotating axle inboard and toward front of car.

**NOTE:** Guide axle over front cross member and out from underside of car.

#### b. Installation

1. Guide drive axle into position from underside of car.

**NOTE:** Guide axle up and over front cross member and engage drive axle splined end in knuckle and hub.

2. Rotate inner end of drive axle rearward toward starter motor.

3. Apply clean front wheel bearing grease between lips of output shaft seal, then install output shaft into final drive unit, from under side of car, indexing splines of output shaft with final drive.

4. Install two output shaft support to engine bolts and washers. Tighten bolts to 50 foot-pounds.

**NOTE:** Seat washers in old grooves in output shaft support. If a new output shaft support is being installed, perform the following procedure: When attaching the right hand output shaft support to the engine block, do not let the shaft and support assembly hang in the final drive unit. Install support bolts and washers loosely, and by moving the flange end of the shaft up and down, and back and forth, find the center location. Hold the shaft in this position and then tighten bolts to 50 foot-pounds.

5. Install self-tapping screw, support to final drive brace.



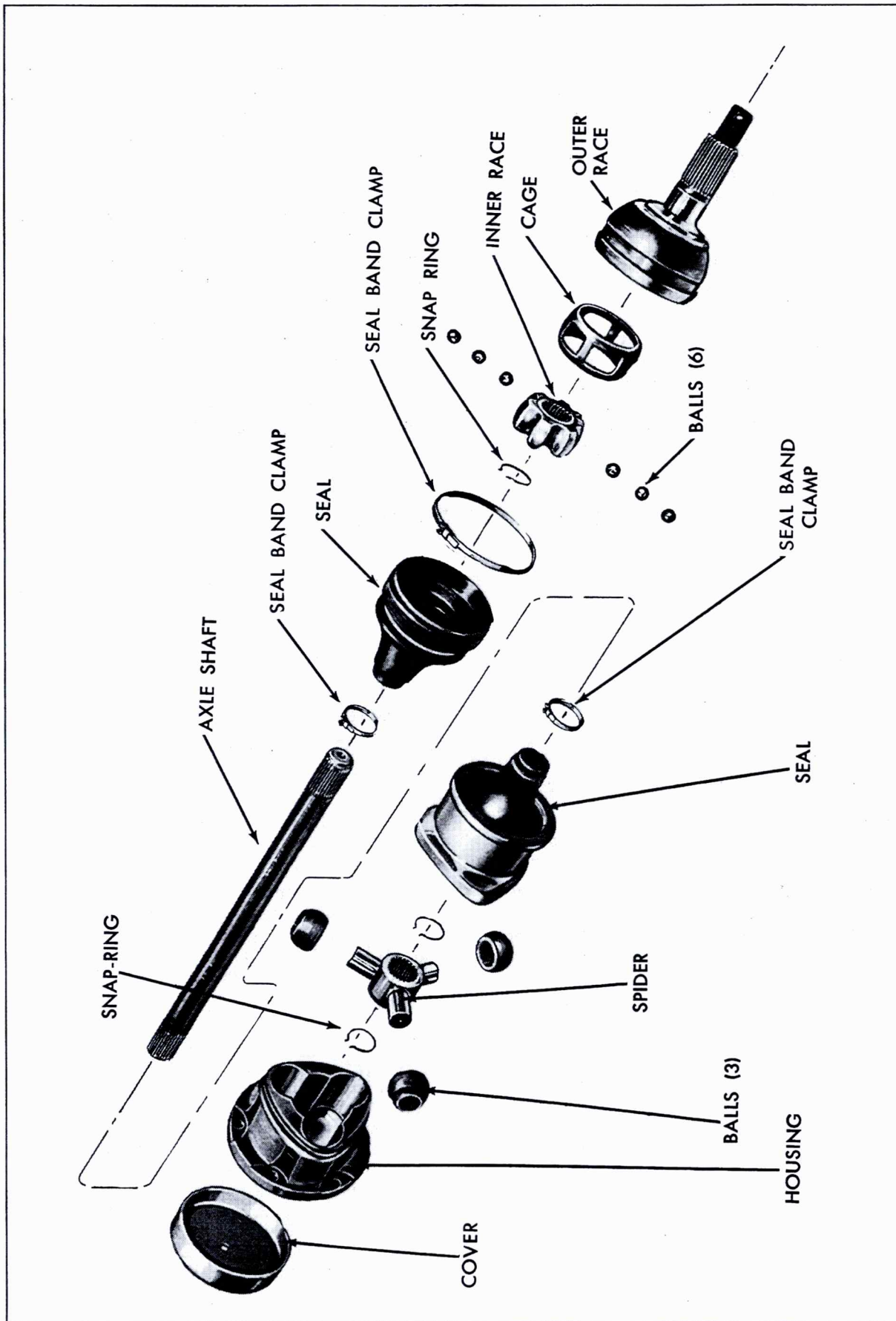


Fig. 3-58 Drive Axle Disassembled

6. Rotate drive axle toward front of car and into position.

7. Install six drive axle to output shaft screws and lock washers. Tighten screws to 65 foot-pound.

NOTE: Have a helper apply the brakes to prevent the drive axle from turning when performing step 7.

8. Install drive axle spindle nut. Do not tighten nut at this time.

9. Install wheel and tire and wheel mounting nuts. Do not tighten nuts at this time.

10. Lower car.

11. Tighten wheel mounting nuts to 105 foot-pounds.

12. Adjust wheel bearings as described in Note 18.

13. Connect negative battery cable.

14. Check final drive oil level and check for oil leaks at output shaft.

### 36. Left Hand Drive Axle

#### a. Removal

1. Remove wheel disc.

2. Loosen wheel mounting nuts.

3. Remove spindle nut cotter pin and loosen spindle nut.

4. Raise car and install a short piece of rubber hose on torsion bar connector as shown in Fig. 3-43.

5. Remove wheel mounting nuts and remove wheel.

6. Remove drive axle spindle nut.

7. Remove six drive axle to output shaft screws.

NOTE: Have a helper apply the brakes to prevent drive axle from rotating when removing screws.

8. Loosen shock absorber upper mount bolt.

9. Remove stabilizer bar link bolt cotter pin and nut.

10. Remove upper spherical joint cotter pin and nut.

11. Using a hammer, strike knuckle in area of upper spherical joint. Lift up on upper arm and remove joint stud from steering knuckle and brake line clip from joint stud.

CAUTION: Use extreme care to prevent hammer from slipping and hitting brake hose.

12. Remove brake hose bracket from frame.

13. Carefully tip disc and knuckle assembly out at upper end to extent of brake hose.

CAUTION: Wire assembly to upper control arm so that brake hose does not support the weight of the knuckle assembly.

14. Rotate inner end of drive axle toward front of car.

15. Guide drive axle out of knuckle and remove drive axle from car.

#### b. Installation

1. Guide drive axle into car and install drive axle spindle into steering knuckle.

2. Align drive axle inner joint flange with output shaft flange.

3. Install six drive axle to output shaft screws and washers. Tighten screws to 65 foot-pounds.

NOTE: Have helper apply brakes to prevent axle from rotating when installing screws.

4. Carefully remove wire supporting knuckle assembly, then lift up on upper control arm and install upper spherical joint stud in steering knuckle.

5. Install brake line clip on upper spherical joint stud.

6. Install nut on upper spherical joint stud. Tighten nut to 40 foot-pounds and install cotter pin.

NOTE: Use extreme care when performing step 6 to prevent damage to brake line.

7. Install brake line bracket on frame.

8. Tighten shock absorber upper mount nut to 75 foot-pounds.

9. Using a new link bolt, install stabilizer bar as described in Note 31b.

10. Install drive axle spindle washer and nut. Do not tighten nut at this time.

11. Install wheel and wheel mounting nuts. Do not tighten nuts at this time.

12. Remove piece of rubber hose from lower control arm torsion bar connector and lower car.

13. Tighten wheel mounting nuts to 105 foot-pounds.

14. Adjust front wheel bearings as described in Note 18, then install drive axle spindle nut cotter pin.

15. Install wheel disc.

### 37. Outer Constant Velocity Joint (Ball Type)

The outer constant velocity joints are replaced as an assembly and are disassembled for repacking and replacement of seals only.

#### a. Disassembly

1. Insert axle assembly in vise. Clamp on mid-portion of axle shaft.

2. Remove inner and outer seal band clamps as shown in Fig. 3-59.

3. Slide seal down axle shaft to gain access to the constant velocity joint.

NOTE: Wipe excess grease from joint to permit access to the snap ring.

4. Using Snap Ring Pliers, J-8059, spread snap ring and slide joint off axle spline as shown in Fig. 3-60.

5. Remove inner race snap ring as shown in Fig. 3-61.

6. Slide seal off axle shaft.



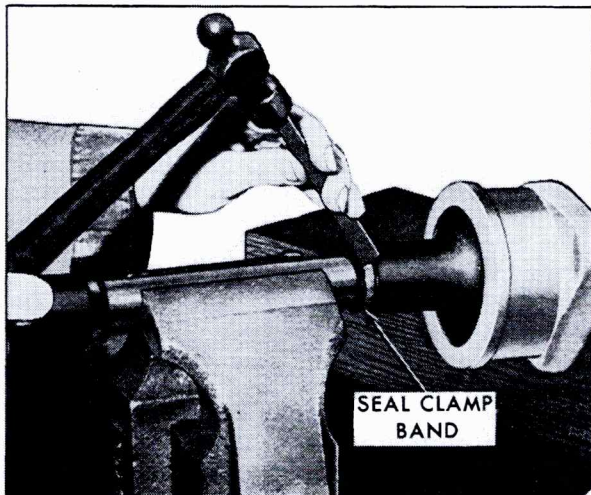


Fig. 3-59 Removing Seal Clamp Bands

7. To remove the balls, hold the constant velocity joint with one hand, then tilt cage and inner race as shown in Fig. 3-62 so that one ball can be removed. Continue until all six balls are removed.

NOTE: It may be necessary to use a brass drift and tap on outer surface of cage to permit rotation of cage.

8. Turn cage 90° as shown in Fig. 3-63 with slot in cage aligned with short land on outer race and lift cage out with inner race.

9. Turn short land of inner race 90° in line with hole in cage. Lift land on inner race up through hole in cage, then turn up and out to separate parts as shown in Fig. 3-64.

#### b. Cleaning and Inspection (Outer Joint)

Wash all parts thoroughly in a cleaning solvent

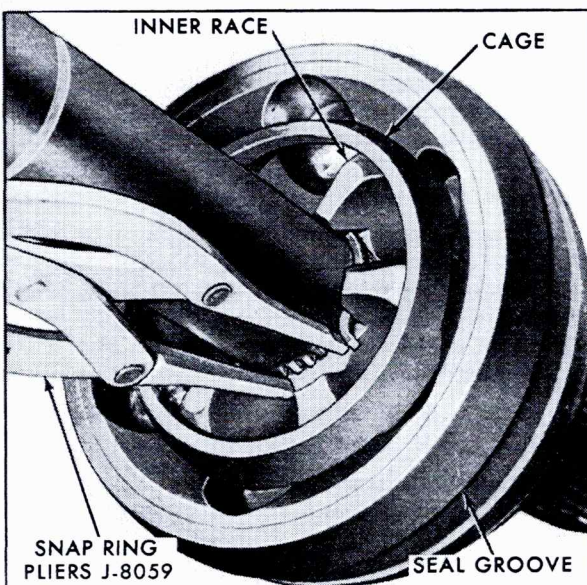


Fig. 3-60 Removing Outer Joint From Axle

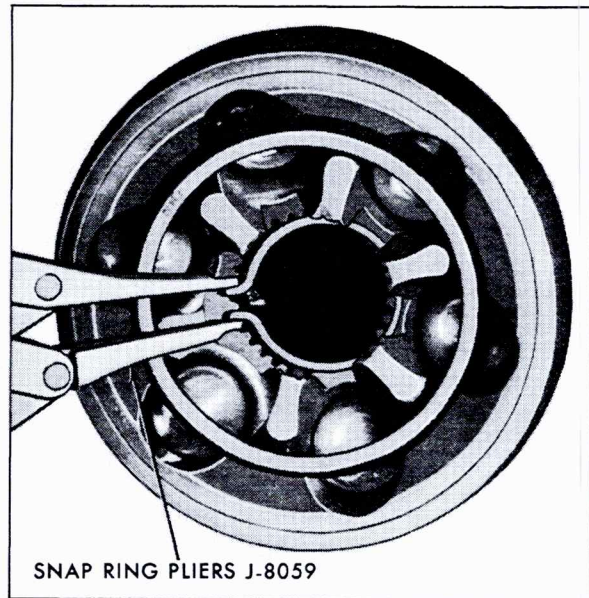


Fig. 3-61 Removing and Installing Inner Snap Ring

and dry with compressed air. Inspect rubber seals for damage or wear. If seals are damaged or worn, replace with new seals.

1. Inspect outer race housing splines and threads for any damage.
2. Inspect balls (six) for nicks, cracks, scores or wear.
3. Inspect cage for cracks or wear.
4. Inspect inner race for excessive wear, scores or cracks.
5. Inspect snap ring.

NOTE: If any of the first four defects are found, the constant velocity joint assembly must be replaced as a unit.

#### c. Assembly

1. Insert short land of inner race into slot in

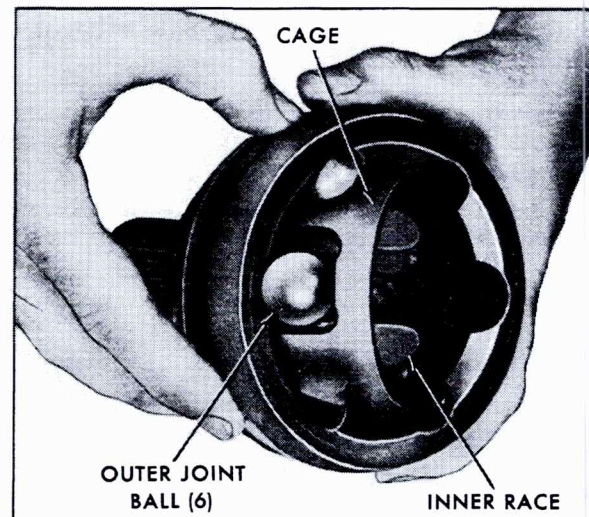


Fig. 3-62 Removing Balls From Outer Joint



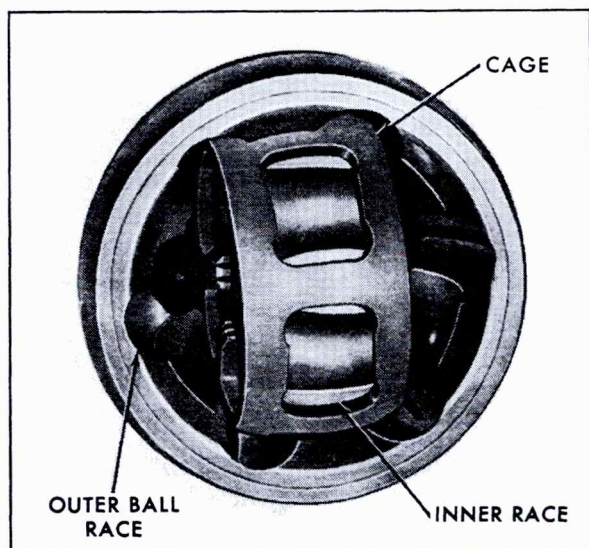


Fig. 3-63 Removing Cage and Inner Race

cage, and pivot to install in cage as shown in Fig. 3-64.

2. Pack constant velocity joint with special drive axle joint lubricant, available from servicing Parts Warehouses.

NOTE: One can of lubricant will service one complete drive axle joint only.

3. Align inner race as shown in Fig. 3-63 and pivot inner race 90° to align in outer race as shown in Fig. 3-61.

4. Apply lubricant to the inner and outer race and insert balls into outer race one at a time as shown in Fig. 3-62, until all six balls are installed.

NOTE: Inner race and cage will have to be tilted as shown so that each ball can be inserted.

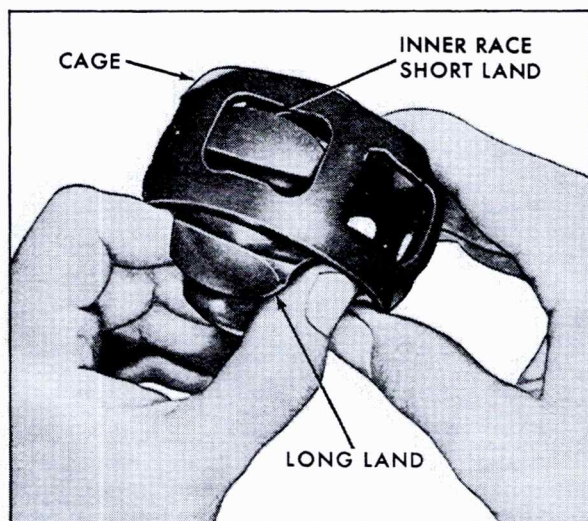


Fig. 3-64 Removing Inner Race From Cage

5. Position small end of seal in groove on axle shaft.

NOTE: When installing outer joint seal on axle shaft, position small end of seal in outer groove in axle shaft, or groove nearest end of axle shaft, Fig. 3-65 and proceed as follows:

a. Loop seal clamp band around seal end twice with strap passing through its own retainer each time a loop is completed.

b. After completion of second loop, feed extra length of strap into small end of Seal Clamp Band Installer, J-22716.

NOTE: Be sure to have the open side of the tool facing up.

c. Slide bolt through holes in side of tool and at the same time, secure strap in slot in the bolt.

d. Lift end of strap up and out of the open side of tool.

e. Place a wrench on bolt and draw band up tight, then torque bolt to 6-8 foot-pounds.

f. Rotate Seal Clamp Band Installer, J-22716, back over the band retainer.

g. Back tool off just enough to permit tapping band with a hammer until it lies flat across top of retainer. Tape the tabs down until they retain strap.

h. Unwind the excess strap and cut it off close to retainer.

6. Pack inside of seal with special drive axle joint lubricant until seal is full.

7. Install snap ring into inner race as shown in Fig. 3-61.

8. Insert axle shaft into splines of outer constant velocity joint until snap ring secures shaft.

NOTE: Snap ring must be spread to facilitate mating of axle shaft into splines of outer constant velocity joint.

9. Position seal in groove of outer race.

NOTE: Mating area of seal and outer race

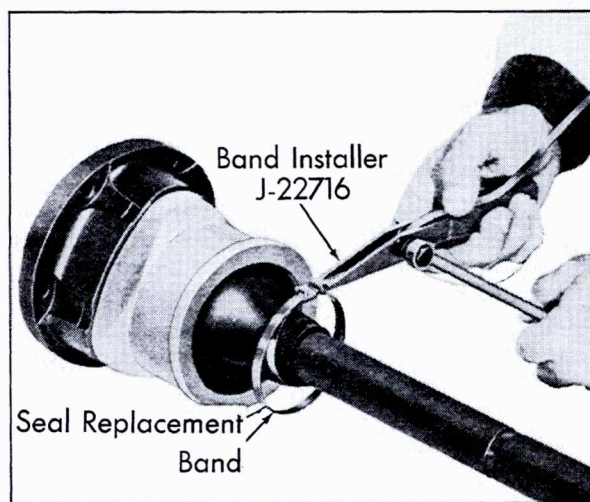


Fig. 3-65 Positioning Seal Clamp Band On Seal



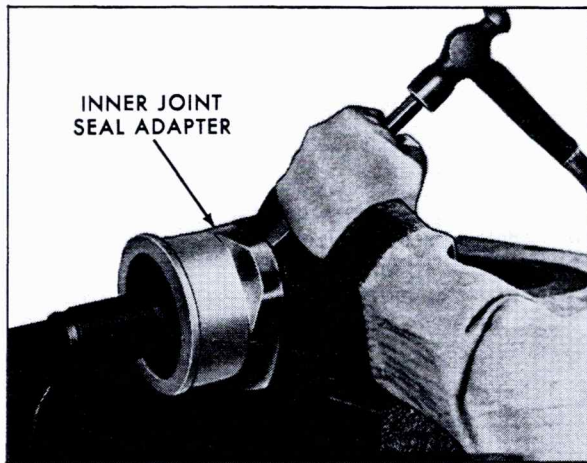


Fig. 3-66 Removing Seal Adapter From Joint Housing

must be free of lubricant to obtain proper sealing.

10. Install large seal clamp band over seal and secure as shown in Fig. 3-65.

### 38. Inner Constant Velocity Joint (Tri-pot Type)

The inner constant velocity joints are disassembled for repacking and replacement of the spider components, seals and housing end cover O-ring.

#### a. Disassembly

1. Insert axle assembly in a vise. Clamp on mid-portion of axle shaft.

2. Remove small seal clamp band as shown in Fig. 3-59.

3. Remove large end of seal from joint housing by prying up crimped edge on seal adapter. Next, drive seal adapter and seal off of joint housing with a hammer and chisel as shown in Fig. 3-66.

**CAUTION:** Use extreme care when removing seal adapter and seal to prevent damaging the seal or seal adapter.

4. Slide seal and adapter down axle shaft until tri-pot joint is exposed.

**CAUTION:** The tri-pot housing is now free to slide off of the joint. Extreme care must be used to prevent spider leg balls from sliding off spider legs. Each leg ball contains several spider needles.

5. Cup one hand under tri-pot joint to prevent dropping spider leg balls while sliding housing off of joint.

6. Remove spider leg balls.

**NOTE:** Use extreme care when removing spider leg balls to prevent dropping or losing leg ball needle bearings, Fig. 3-67.

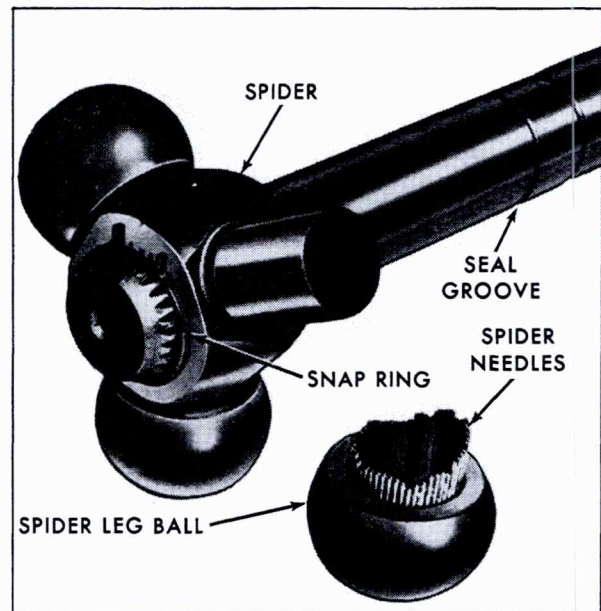


Fig. 3-67 Spider Assembly

7. Remove O-ring seal from outer housing.

8. If necessary to replace tri-pot rear cover or O-ring, proceed as follows:

a. Secure tri-pot housing in a vise.

b. Install a 2" x 2" x 8" block of wood in housing.

c. Drive on wood block with a hammer and remove housing rear cover.

d. Remove housing O-ring and discard O-ring.

9. Wipe excess grease from end of axle shaft to gain access to snap ring and remove spider outer snap ring as shown in Fig. 3-68.

10. Using a plastic mallet, tap alternately on spider legs and drive spider off shaft.

11. Remove spider inner snap ring.

12. Slide seal off axle shaft.

13. Remove needles from spider leg balls.

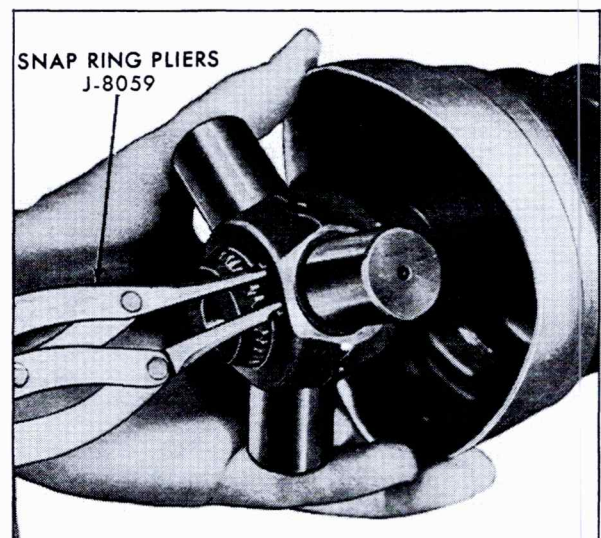


Fig. 3-68 Removing Spider Snap Ring



### b. Cleaning and Inspection (Inner Joint)

Wash all parts thoroughly in a cleaning solvent and dry with compressed air. Inspect rubber seal and O-rings for damage or wear. If seal or O-rings are damaged or worn, replace with new seal or O-rings.

1. Inspect seal adapter band for being bent or cracked.
2. Inspect tri-pot housing for excessive wear and brinelling.
3. Inspect snap rings for distortion or damage.
4. Inspect spider leg balls for excessive wear.
5. Inspect spider leg ball needles for chips and breaks.
6. Inspect spider for excessive wear, scores or cracks.

### c. Assembly

1. Insert axle assembly in a vise. Clamp on mid-portion of axle shaft.
2. Position small end of seal in groove on axle shaft.

NOTE: When installing inner joint seal on axle shaft, position small end of seal in the second groove in the axle shaft, or groove nearest the center of the axle shaft.

3. Place spider inner snap ring in position on axle shaft.
4. Apply special drive axle lubricant to axle and spider splines.
5. Align spider on axle shaft.
6. Using a plastic mallet, tap alternately on spider legs and drive spider into position on axle shaft.
7. Install spider outer snap ring on axle shaft.
8. Place O-ring on tri-pot joint housing.
9. Apply a thin coat of lubricant to inner race on leg balls, and install leg ball needles.
10. Apply lubricant to spider leg balls and legs.
11. Pack inside of seal with approximately two-thirds of special drive axle joint lubricant provided (available from servicing Parts Warehouses).
12. Remove axle from vise and install spider leg balls.

CAUTION: When installing leg balls, use extreme care to prevent losing or disengaging spider needles from spider leg balls.

13. Pack remainder of special drive axle lubricant in tri-pot housing and install tri-pot housing by sliding housing over spider leg balls.

14. Position seal adapter over lip on joint housing and stake as shown in Fig. 3-69.

NOTE: Mating area of seal adapter and joint housing must be free of lubricant to obtain proper mating and sealing.

15. Install seal clamp band on small end of seal, Fig. 3-69. Proceed as follows:

- a. Loop seal clamp band around seal twice with

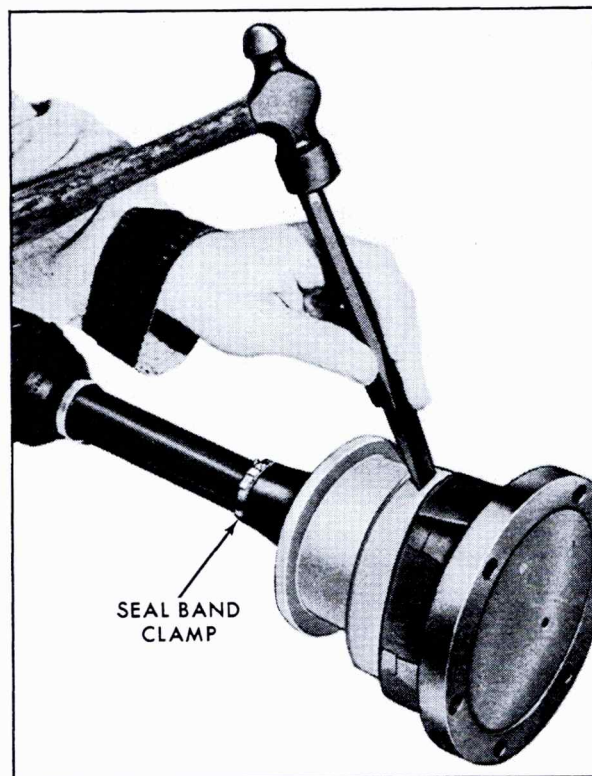


Fig. 3-69 Installing Seal Adapter On Joint Housing

strap passing through its own retainer each time a loop is completed, Fig. 3-65.

- b. After completion of second loop, feed extra length of strap into small end of Seal Clamp Band Installer, J-22716.

NOTE: Be sure to have the open side of the tool facing up.

- c. Slide bolt through holes in side of tool and

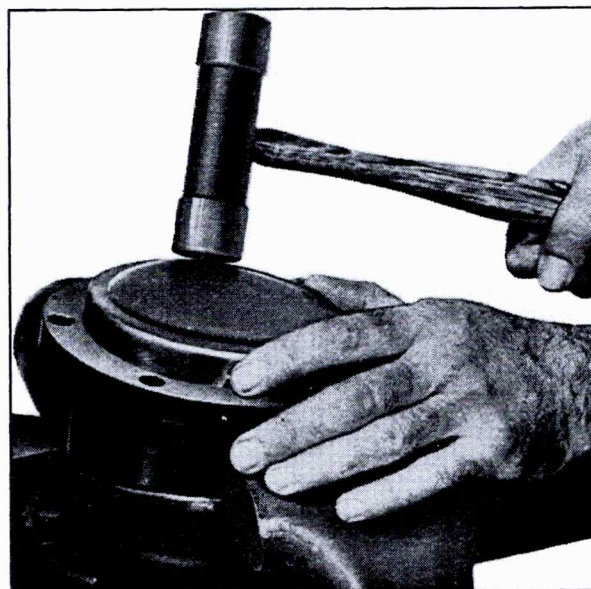


Fig. 3-70 Installing Tri-Pot Housing End Cover



at same time, secure strap in slot in the bolt.

d. Lift strap up and out of open side of tool.

e. Place a wrench on bolt and draw band up tight, then torque bolt 6-8 foot-pounds.

f. Rotate Seal Clamp Band Installer, J-22716, back over band retainer.

g. Back tool off just enough to permit tapping band with a hammer until it lies flat across top of retainer. Tap tabs down until they retain strap.

h. Unwind excess strap and cut it off close to retainer.

16. If tri-pot housing cover and O-ring were removed, install a new O-ring in tri-pot housing.

17. Position cover on housing.

18. Seat cover in housing by tapping around outer edge of cover with a plastic mallet, Fig. 3-70.

## GENERAL DESCRIPTION

Torque from the final drive is transmitted to right and left output shafts which connect to drive axles. The right and left output shafts are splined to individual side gears in the final drive unit.

**CAUTION:** If any mispositioning, incorrect assembly, or failure of components in the area of the brake system pipes, hoses, or cylinders is observed, be sure to check for any brake damage that may have resulted from such a condition and correct as required. Components that could damage the brake system due to mispositioning incorrect assembly or failure include the exhaust system, shock absorber, springs, suspension control arms, stabilizer bar, power steering pump hoses and transmission cooler pipes.

### 39. Right Hand Output Shaft (Fig. 3-71)

#### a. Removal

1. Disconnect negative battery cable.
2. Raise car.
3. Install a short length of rubber hose on lower control arm torsion bar connector as shown in Fig. 3-43.
4. Remove six drive axle to output shaft screws and lock washers.

**NOTE:** When performing step 4, it will be necessary to have a helper apply the brakes to prevent the drive axle from turning.

5. Remove two output shaft support to engine bolts and one support to brace self-tapping screw.
6. Rotate inboard end of drive axle rearward toward starter motor.
7. Pull output shaft straight out toward side of car. When splined end of shaft is out of final drive

unit, lower splined end and remove from underside of car.

**CAUTION:** Extreme care must be taken to protect final drive oil seal surface on output shaft from nicks and scratches.

#### b. Installation

1. Apply clean front wheel bearing grease between lips of output shaft seal, then install output shaft into final drive unit, from under side of car, indexing splines of output shaft with final drive.
2. Install two output shaft support to engine bolts and washers. Tighten bolts to 50 foot-pounds.

**NOTE:** Seat washers in old grooves in output shaft support to obtain proper alignment of output shaft. If a new output shaft support is being installed, perform the following procedure: When attaching the right hand output shaft support to the engine block, do not let the shaft and support assembly hang in the final drive unit. Assemble support bolts loosely, and by moving the flange end of the shaft up and down, and back and forth, find the center location. Hold the shaft in this position and then tighten bolts to 50 foot-pounds.

3. Install self-tapping screw, support to final drive brace.
4. Rotate drive axle toward front of car and into position.
5. Install six drive axle to output shaft screws and lock washers. Tighten screws to 65 foot-pounds.

**NOTE:** Have a helper apply the brakes to prevent the drive axle from turning when performing step 5.

6. Lower car.
7. Connect negative battery cable.
8. Check final drive oil level and check for oil leaks at output shaft.

### 40. Right Hand Output Shaft Bearing

#### a. Removal

1. Remove output shaft as described in Note 39a.
2. Remove three output shaft bearing retainer to support self tapping screws.
3. Clamp output shaft in a vise as shown in Fig. 3-72.

**CAUTION:** Use extreme care to prevent damage to seal surface on output shaft.

4. Make two steel plates 1/4" x 3" x 8" and install in a vise as shown in Fig. 3-72.
5. Install four 3/8 - 24 bolts, five inches long on output shaft and install output shaft between steel plates in vise as shown in Fig. 3-72.

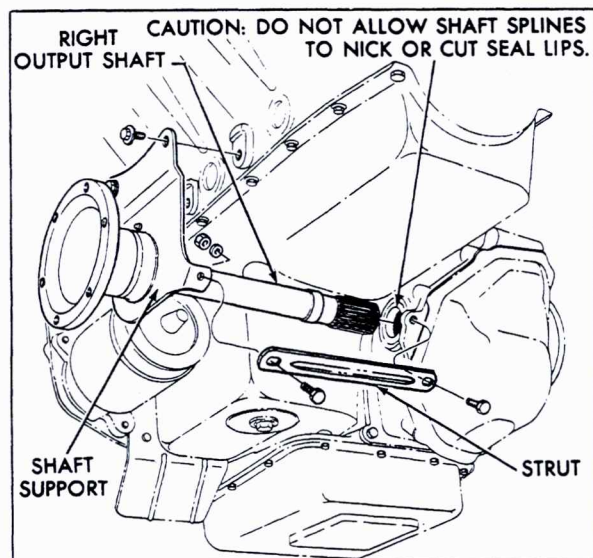


Fig. 3-71 Right Hand Output Shaft



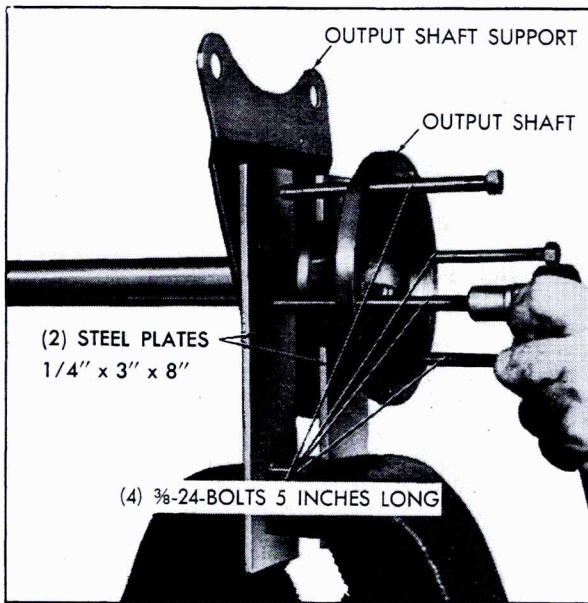


Fig. 3-72 Removing Right Hand Output Shaft Support and Bearing

6. Remove bearing assembly by tightening bolts alternately.

#### b. Installation

1. Position output shaft on flange end on a work bench, Fig. 3-73.
2. Lubricate output shaft support and install over splined end of output shaft.

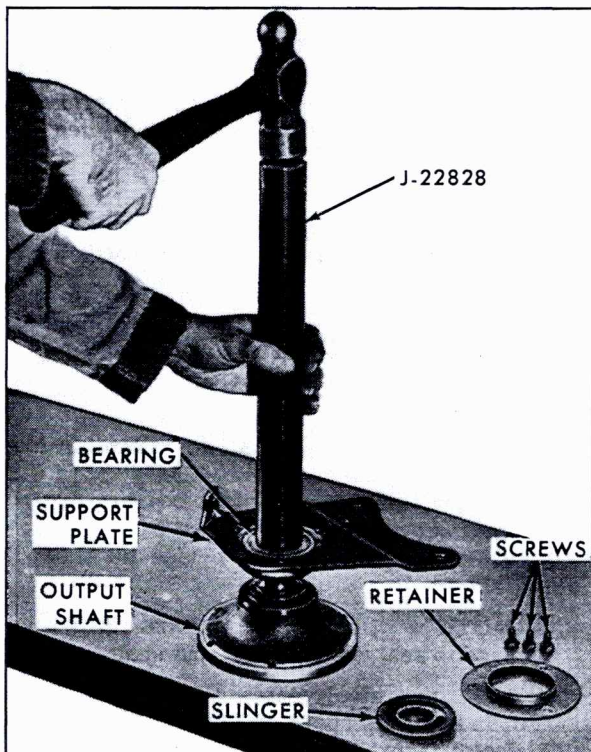


Fig. 3-73 Installing Right Hand Output Shaft Support and Bearing

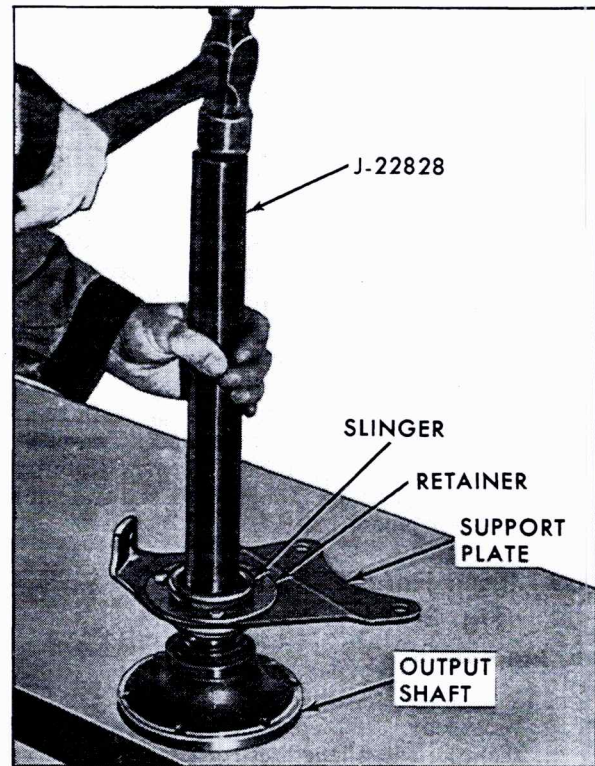


Fig. 3-74 Installing Right Hand Output Shaft Support Slinger

3. Lubricate bearing and install, using a hammer and Bearing Installer, J-22829, Fig. 3-73.
4. Lubricate exposed face of bearing and install bearing retainer. Secure bearing retainer with three self-tapping screws.
5. Using a hammer and Bearing Installer, J-22828, install slinger as shown in Fig. 3-74.
6. Install output shaft as described in Note 39b.

### 41. Left Hand Output Shaft

#### a. Removal

1. Remove wheel disc.
2. Loosen wheel mounting nuts.
3. Remove drive axle spindle nut cotter pin and loosen nut.
4. Raise car.
5. Remove wheel mounting nuts and drive axle spindle nut.
6. Remove wheel and tire.
7. Remove left drive axle as described in Note 36a.
8. Remove left output shaft retaining bolt.

NOTE: To remove bolt, install two screws in output shaft flange to prevent output shaft from rotating.

9. Remove output shaft by pulling straight out toward side of car.

CAUTION: Use extreme care when removing output shaft to protect oil seal surface on shaft from nicks and scratches.

**b. Installation**

1. Apply clean wheel bearing grease between lips of final drive output shaft seal.
2. Install output shaft from underside of car.

CAUTION: Use extreme care when indexing output shaft splines with splines in final drive unit to prevent damage to the splines.

3. Install output shaft retaining bolt. Tighten bolt to 45 foot-pounds.

NOTE: To install bolt, install two screws in output shaft flange to prevent output shaft from rotating.

4. Install drive axle as described in Note 36b.
5. Install drive axle spindle nut; do not tighten nut at this time.
6. Install wheel and tire, do not tighten nuts at this time.
7. Lower car.
8. Tighten wheel mounting nuts to 105 foot-pounds.
9. Tighten drive axle spindle nut to 105 foot-pounds and install cotter pin.
10. Install wheel disc.
11. Check final drive oil level and check for oil leaks at output shaft.

## 42. Output Shaft Seal Replacement

**a. Removal**

1. To replace right output shaft seal, remove right output shaft as described in Note 39a. Then

remove seal from final drive unit with a pry bar and discard seal.

CAUTION: When removing seal, use extreme care to prevent damaging seal surface in final drive unit.

2. To replace left output shaft seal, remove left output shaft as described in Note 41a. Then remove seal from final drive unit with a pry bar and discard seal.

CAUTION: When removing seal, use extreme care to prevent damaging seal surface in final drive unit.

**b. Installation**

1. To install right hand output shaft seal in final drive, attach Universal Handle, J-8092, to Seal Installer, J-22760. Then place seal in final drive unit and drive on Universal Handle, J-8092, until seal is installed. Apply clean front wheel bearing grease between lips of seal.

CAUTION: Rotate tools to maintain proper alignment when installing seal.

2. Install right hand output shaft as described in Note 39b.

3. To install left hand output shaft seal in final drive, attach Universal Handle, J-8092, to Seal Installer, J-22199. Then place seal in final drive unit and drive on Universal Handle, J-8092, until seal is installed.

NOTE: The left hand output shaft seal contains a hole for venting the final drive unit. The top of the seal is identified by the word "Top" and must be installed with the word "Top" positioned up so that vent will be in proper position.

4. Install left hand output shaft as described in Note 41b.



**GENERAL DESCRIPTION**

The final drive assembly is mounted and splined directly to the transmission. The final drive consists of a pinion drive gear, ring gear and a bevel gear differential gearset similar to that used in a conventional differential.

The lubricant level for the final drive unit should be checked at each oil change period. When checking the lubricant level, always clean

dirt or foreign material from around plug opening before removing filler plug. The lubricant level should be maintained level with filler plug hole in cover. Periodic or seasonal lubricant changes are not recommended.

The gear ratio of the final drive assembly on the Eldorado is 3.07-1.

**SERVICE INFORMATION**

**CAUTION:** If any mispositioning, incorrect assembly, or failure of components in the area of the brake system pipes, hoses, or cylinders is observed, be sure to check for any brake damage that may have resulted from such a condition and correct as required. Components that could damage the brake system due to mispositioning, incorrect assembly or failure include the exhaust system, shock absorber, springs, suspension control arms, stabilizer bar, power steering pump hoses and transmission cooler pipes.

**43. Final Drive**

The final drive unit is not serviced, but is replaced as a unit with the exception of the various seals and gaskets. Those seals that are serviced are: the pinion oil seals, output shaft seals, pinion bearing housing O-ring vent pin seal cover gasket and filler plug gasket.

**a. Removal**

1. Raise hood and disconnect negative battery cable.
2. Pump approximately one gallon of transmission fluid out of transmission filler tube.
3. Remove bolt securing transmission filler tube bracket to final drive bracket.
4. Remove transmission filler tube.
5. Plug transmission filler tube hole.
6. Remove bolts "A" and "B" and nut "H" securing upper part of final drive case to transmission case, Fig. 3-75.

**NOTE:** The use of a box end wrench with a crescent shaped handle will facilitate the removal of nut "H".

7. Remove bolt securing transmission oil cooler lines to final drive support bracket.
8. Remove nut from large through bolt, final drive support bracket to final drive.
9. Remove nut and bolt, left front engine mount support bracket to engine.
10. Remove bolt, final drive support bracket to left front engine mount support.

11. Remove front wheel discs and loosen wheel mounting nuts.

12. Raise car and remove wheels and tires.

13. Install a short length of heater hose on both lower control arm torsion bar connectors, Fig. 3-43.

14. While helper alternately applies and releases service brakes, loosen 12 screws, six each side securing left and right drive axles to output shafts.

15. Remove six screws and lock washers securing right drive axle to output shaft.

16. Loosen lower nut securing right shock absorber to lower control arm.

**NOTE:** DO NOT remove nut.

17. Remove two self tapping screws securing brace from final drive case to right hand output shaft support and remove brace.

18. Remove battery cable clip attached to frame above right hand drive axle.

19. Remove two bolts securing right hand output shaft support to engine.

20. Rotate drive axle rearward toward starter motor to gain access to output shaft.

21. Remove right hand output shaft by sliding straight out toward side of car. When splined end of shaft is clear of final drive unit, lower splined end and remove output shaft from under side of car.

**CAUTION:** Extreme care must be used when removing output shaft to protect seal surface on shaft from nicks and scratches.

22. Remove six screws and lock washers securing left hand drive axle to output shaft.

23. Loosen ten screws securing final drive cover to final drive and allow lubricant to drain.

24. Remove ten screws securing final drive cover to final drive and remove cover.

25. Compress left hand drive axle inner constant velocity joint. Using a piece of wire, secure drive axle to frame in compressed position to permit clearance for removal of final drive unit with left hand output shaft installed.

26. Remove large through bolt, final drive support bracket to final drive and remove bracket.

NOTE: Final drive assembly can be removed or installed with a transmission lift and special adapter. Special adapters are available commercially through lift equipment manufacturers. Follow the instructions and recommendations of the equipment manufacturer.

27. Remove bolts "C", "D", "E", "F", and nut "G".

28. Disengage final drive splines from transmission.

29. Remove final drive unit from underside of car by sliding unit toward front of car, permitting ring gear to rotate up over steering linkage and work unit free from car.

30. Remove support bracket from final drive unit.

31. Remove transmission to final drive gasket and discard gasket.

#### b. Installation

1. Apply transmission fluid on the transmission

side of a new final drive to transmission gasket, then position gasket on transmission.

2. Install final drive unit from under side of car by sliding unit up and toward front of car, permitting ring gear to rotate up over steering linkage.

3. Align final drive splines with splines in transmission.

4. Align the two bolt studs "G" and "H" on the transmission with their mating holes in the final drive. Slide final drive until it mates with the transmission.

NOTE: It may be necessary to rotate the left output shaft so that the splines on the final drive pinion engage the splines of the transmission output shaft. Do not allow gasket to become mispositioned when engaging splines.

5. Install bolts "C", "D", "E", "F" and nut "G" finger tight.

6. Install support bracket on final drive unit.

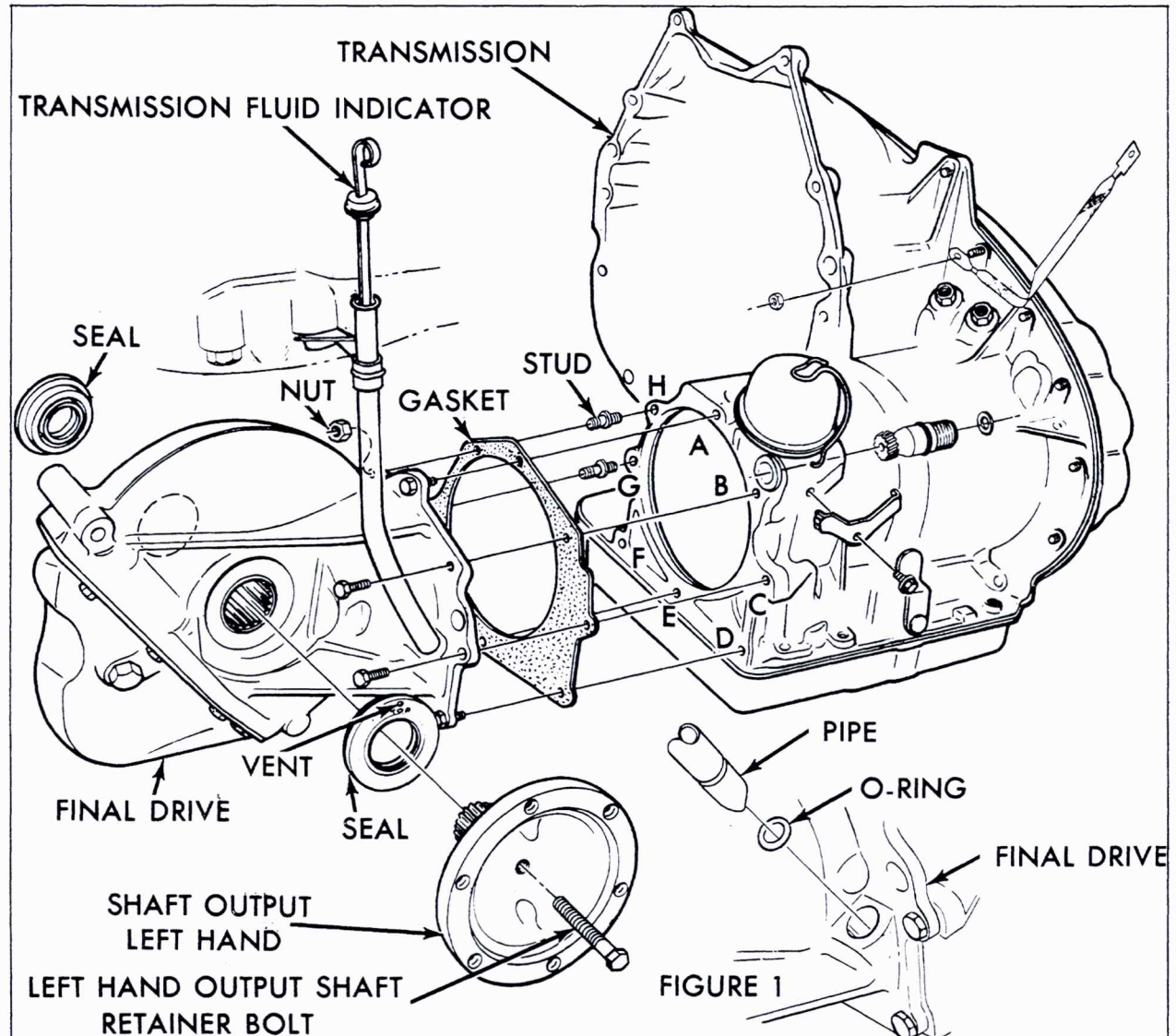


Fig. 3-75 Final Drive Attachment



NOTE: It may be necessary to work bracket back and forth several times to obtain proper mounting position.

7. Install large through bolt, final drive support bracket to final drive. Tighten nut finger tight.
8. Install small bolt, final drive support bracket to left front engine mount support.
9. Install long bolt and nut, left front engine mount support bracket to engine. Tighten nut to 20 foot-pounds.
10. Tighten nut on large through bolt, final drive support bracket to final drive to 70 foot-pounds.

NOTE: This torque is to be applied to head of bolt while nut is held.

11. Install bolt in oil cooler lines clamp and tighten bolt to 8 ft. lbs.
12. Tighten bolts "C", "D", "E", "F" and nut "G" to 25 foot-pounds.
13. Remove wire retaining left hand drive axle.
14. Position left hand drive axle and install six drive axle to output shaft screws and lock washers. Tighten screws to 65 foot-pounds.
15. Install right hand output shaft in final drive, using extreme care when indexing splines of output shaft with splines on final drive.

NOTE: Follow output shaft alignment procedure as outlined in Note 39b.

CAUTION: Extreme care must be used when installing output shafts to protect seal surface on shaft from nicks and scratches, and also to protect the seal from cuts.

16. Install two bolts and washers securing right hand output shaft support to engine. Tighten bolts to 50 foot-pounds.

NOTE: Washers must be seated in grooves in support to assure proper alignment of the output shaft.

17. Rotate right hand drive axle toward front of car and align with output shaft.
18. Install six drive axle to output shaft screws and lock washers and tighten to 65 foot-pounds.

NOTE: It will be necessary to have a helper alternately apply and release the service brakes when installing the drive axle to output shaft screws.

19. Remove short lengths of heater hose previously installed on lower control arm torsion bar connectors.
20. Attach battery cable clip to frame above right hand drive axle.
21. Install brace, final drive to right hand output shaft support and secure with two self-tapping screws. Tighten screws to 12 foot-pounds.
22. Tighten right hand shock absorber lower mount nut to 75 foot-pounds.
23. Install new cover gasket on final drive.
24. Position final drive cover to final drive and

secure with ten screws. Tighten screws to 30 foot-pounds.

25. Fill final drive unit.
26. Install wheels and tires and tighten mounting nuts finger tight.
27. Lower car.
28. Tighten wheel mounting nuts to 105 foot-pounds and install wheel discs.
29. Install bolts "A" and "B" and nut "H" securing upper part of final drive case to transmission case. Tighten bolts and nut to 25 foot-pounds.
30. Install a new O-ring on transmission filler pipe, Fig. 3-75.
31. Remove plug and install transmission filler pipe, positioning clamp to final drive case and secure with one bolt.
32. Check engine oil level, start engine and check transmission fluid level. Add fluid as required.
33. Check output shaft seals, final drive to transmission connection and final drive cover for oil leaks.
34. Connect negative battery cable.

## 44. Pinion Bearing Oil Seal Replacement

### a. Removal

1. Remove final drive unit from car as described in Note 43a.
2. Working on bench, remove six pinion bearing housing to final drive case bolts.
3. Remove pinion bearing housing by applying a steady pull on splined end of pinion gear with one hand and gently rotating pinion bearing housing with other hand.
4. Remove pinion bearing housing O-ring and discard.
5. Inspect vent pin O-ring seal and replace if necessary.
6. Drive pinion gear oil seals from pinion bearing housing with a screwdriver.

CAUTION: Use extreme care to prevent damage to pinion bearing housing oil seal surface.

### b. Installation

1. Place pinion gear oil seals back to back with spring on seals exposed.
2. Install oil seals on Seal Installer, J-22212.
3. Drive on Seal Installer, J-22212, until tool bottoms against housing.
4. Install a new pinion bearing O-ring in final drive case.
5. Install pinion gear in final drive case.
6. Install Seal Protector, J-22236, over splined end of pinion gear.
7. Install pinion bearing housing over pinion gear. Gently rotate pinion bearing housing until properly seated in final drive case.
8. Install six pinion bearing housing to final drive case bolts. Tighten bolts to 35 foot-pounds.
9. Remove Seal Protector, J-22236.
10. Install final drive unit in car as described in Note 43b.

**TORQUE SPECIFICATIONS (693 Only)**

Material No.	Application	Size	Foot-Pounds
286-M	Drive Axle Nut . . . . .	1-20	105
SAE 1020-1022	Stabilizer Link Bolt . . . . .	5/16-18	14
GM 6010-M	Stabilizer Bracket to Frame . . . . .	5/16-18	14
280-M	Torsion Bar Crossmember Bolt . . . . .	7/16-14	40
301-M	Shock Absorber (upper) . . . . .	9/16-12	75
301-M	Shock Absorber (lower) . . . . .	9/16-12	75
300-M	Lower Control Arm Bushing Bolts . . . . .	1/2-13	75
300-M	Upper Control Arm Bushing Bolts . . . . .	1/2-20	75
301-M	Ball Joint Nut . . . . .	9/16-18	40
286-M	Tie-Rod to Knuckle . . . . .	1/2-20	45
300-M	Inner Constant Velocity Joint to Output Shaft . . . . .	3/8-24	65
275-M	Output Shaft Support to Engine Block. . . . .	7/16-14	50
GM 6010-M	Output Shaft Support to Brace . . . . .	5/16-18	12
GM 6010-M	Output Shaft Support Brace to Final Drive . . . . .	5/16-18	12
300-M	Left Hand Output Shaft Retainer Bolt. . . . .	3/8-24	45
280-M	Bearing Retainer (Disc Brake) . . . . .	3/8-16	30

NOTE: Refer to back of Manual, Page 16-1, for bolt and nut markings, and steel classifications.



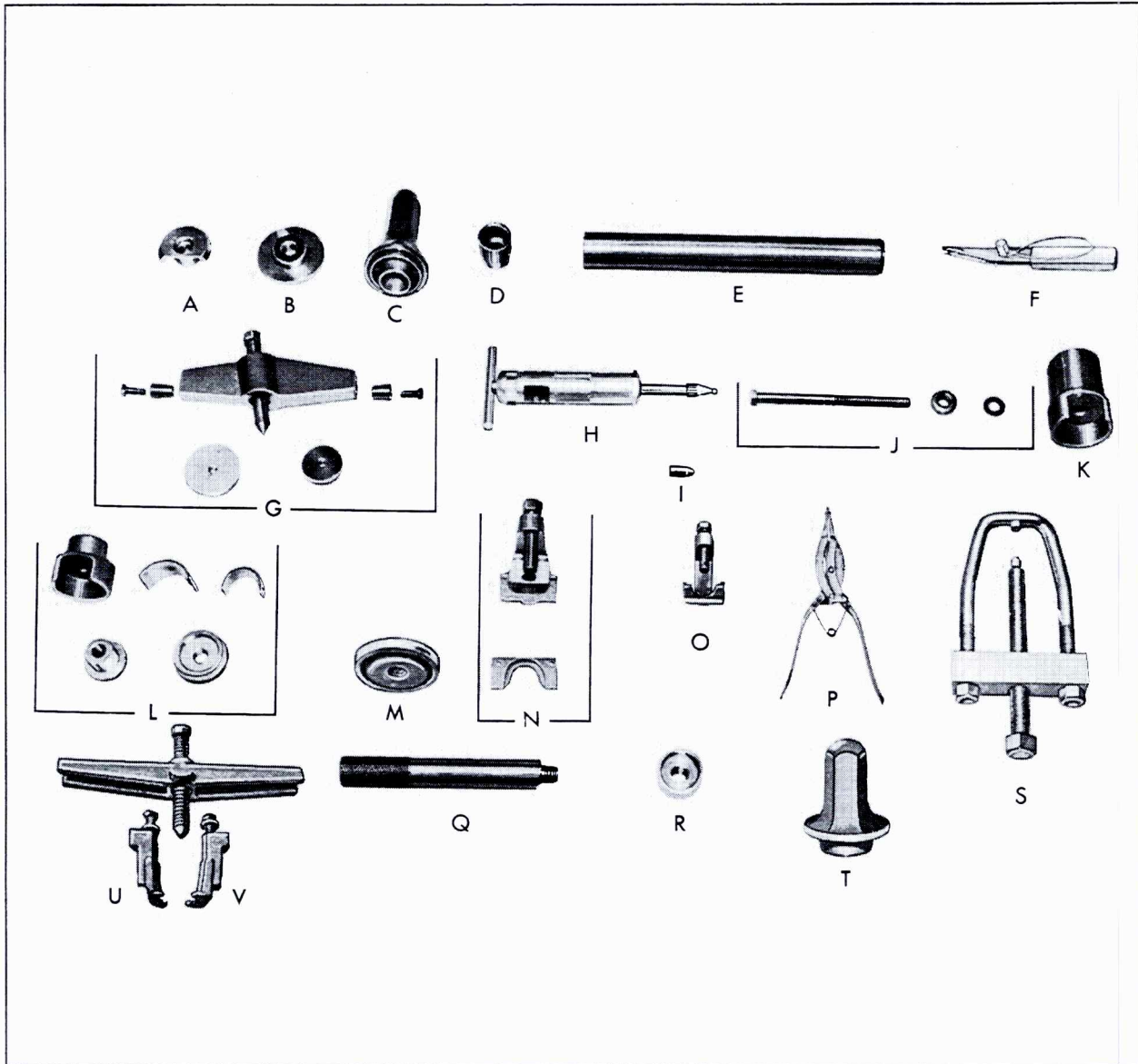


Fig. 3-76 Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-22760	Right Hand Output Shaft Seal Installer	L	J-22222	Bushings Remover and Installer Set
B	J-22199	Left Hand Output Shaft Seal Installer	M	J-23114	Front Knuckle Outer Seal Installer
C	J-22212	Pinion Oil Seal Installer	N	J-22292	Linkage Puller
D	J-22236	Pinion Oil Seal Protector	O	J-21930	Tie Rod End Puller
E	J-22828	Output Shaft Bearing Installer	P	J-8059	Snap Ring Pliers
F	J-22716	Band Installer	Q	J-8092	Universal Handle
G	J-22214	Knuckle and Bearing Remover	R	J-8999-16	Bushings Installer
H	J-9280	Lubrication Gun	S	J-22517	Torsion Bar Remover and Installer
I	J-9280-5	Adapter Tip	T	J-23115	Front Knuckle Inner Seal Installer
J	J-21474-3	Screw Assembly	U	J-23345-1	Bearing Puller
K	J-21474-5	Bushings Remover and Installer	V	J-8433-1	Puller Bar